BIOLOGICAL ASSESSMENT

FY 2004-2008 MAINTENANCE DREDGING,

Of the SNOHOMISH RIVER NAVIGATION CHANNEL, LOWER AND UPSTREAM SETTLING BASINS,

EVERETT, WASHINGTON

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1.0 INTRODUCTION

This Biological Assessment (BA) addresses the effects of U.S. Army Corps of Engineers (Corps) fiscal years 2004-2008 routine maintenance dredging of the lower and upstream settling basins and portions of the navigation channel in the Snohomish River, Everett, Washington. This BA addresses fish and wildlife species that are protected under the Endangered Species Act (ESA) of 1973 and under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries), collectively referred to hereafter as the Services. This BA specifically addresses species that are listed, proposed, or candidates for listing under the ESA that may potentially occur within the lower Snohomish River, including the vicinity of Jetty Island.

Previously, separate BAs were prepared for the upper and downstream settling basins and their associated disposal sites. The most recent of which was a BA prepared for effects associated with Fiscal Year 2002 maintenance dredging within the navigation channel and at the upstream settling basin and beneficial use of the dredged material at Jetty Island and the Port of Everett's Riverside Business Park site (USACE 2001). Both the USFWS and NOAA Fisheries have previously concurred with effect determinations made in that BA (USFWS 2001 – reference number 1-3-01-I-2151, NMFS 1999a – WSB-99-143). This BA has been prepared to evaluate the effects of routine maintenance dredging of both the downstream and upstream settling basins and their associated sections of the navigation channel over a time period spanning fiscal years 2004-2008.

As part of the U.S. Environmental Protection Agency's (EPA) planned remedial actions at the Pacific Sound Resources (PSR) Superfund Site, the sediment dredged from the settling basins may be used to cap a portion of the Marine Sediments Unit (MSU) within the PSR Superfund Site. If the sediment were unacceptable for use as capping material (based on sediment analysis results), the dredged sediment would then be disposed of at the Washington Department of Natural Resources (WDNR) managed Puget Sound Dredged Disposal Analysis (PSSDA) open-water, non-dispersive disposal site at Port Gardner, provided the sediment analysis results indicate sediment suitability for open water disposal.

Both USFWS and NOAA Fisheries (USFWS 2003, NMFS 2003a) have concurred with effect determinations related to capping of the MSU portion of the PSR Superfund site, as presented in a Biological Assessment prepared for the PSR Superfund Site (USACE and EPA 2002). Similarly, both USFWS and NOAA Fisheries have also concurred (USFWS 2000, NMFS 2000) with effect determinations related to disposal of dredged material at the PSDDA open water site at Port Gardner, as presented in the Programmatic Biological Evaluations prepared for the PSDDA Non-Dispersive Disposal Sites (USACE 2000a and 2000c). NOAA Fisheries has also concurred with Essential Fish Habitat consultation for the PSDDA open water disposal sites (NMFS 2003b). Therefore, this BA will address effects from the potential disposal of dredged materials at these sites in a summary manner and will reference the more detailed material presented in the respective BA documents and concurrence letters.

Since dredged material was last used beneficially on Jetty Island (January 2002), substantial amounts of sediment have not eroded off the island. Therefore, renourishment during fiscal year 2004 with material dredged from the downstream settling basin and adjacent portion of the navigation channel is not likely to occur.

However, if conditions on Jetty Island necessitate future renourishment of sediments to maintain the berm and its associated habitats, appropriately sized dredged sediments may be used from fiscal years 2005 through 2008 dredging activities, as needed and available. This BA addresses potential effects of such beneficial use on Jetty Island in a general manner because the specific details regarding location, elevation, volume, and placement are not known at this time.

Similarly, beneficial use of dredged material from the upstream settling basin is possible at several previously used upland disposal sites along the lower Snohomish River, including the Langus Riverfront Park Rehandling site, the Kimberly Clark log yard site, the Baywood site, and the Port of Everett Riverside Business Park site (Figure 1). These sites have historically served as disposal sites and their future use is dependent upon the need for materials at these sites, the availability of suitable material within the settling basin, and the availability of permits.

The Corps will provide supplemental information to NOAA Fisheries and USFWS detailing the method of dredging, as well as the location, elevation, volume, and placement specifics of any future proposal to use dredged materials beneficially on Jetty Island or at any of the upland sites. This information would be provided as a supplement to this BA and would be based on a determination that a need exists for renourishment/upland placement and suitable material is available based on annual condition surveys within the navigation channel and settling basins, as conducted between fiscal years 2005 and 2008.

1.1 Authority

Part one of this dredging project, adopted June 25, 1910 and modified by subsequent acts, consists of navigation channels, two settling basins, and dikes to serve navigation in Everett Harbor and the Snohomish River. Federal maintenance dredging is required within the lower 6.3 miles of the Snohomish River to remove annually shoaling river sediments. The overall navigation project includes:

(1) a one-mile channel from Puget Sound up the Snohomish River, 15 feet deep at mean lower low water (MLLW) and 150 to 425 feet wide.

(2) an upper channel extending to river mile 6.3, 8 feet deep at MLLW and 150 feet wide.

(3) two settling basins in the river channel;

a. the downstream basin with 200,000 cubic yards (cy) capacity

b. the upstream basin with 1 million cy capacity.

Part two of the project consists of the development of Jetty Island through the beneficial use of dredged material from the settling basins and navigation channel. The Jetty Island berm project was planned, designed, and coordinated by the Port of Everett, the Seattle District Corps, USFWS, Washington Department of Fish and Wildlife (WDFW), and EPA to demonstrate beneficial use of clean dredged material for habitat development. Jetty Island is approximately 2 miles long and covers an area of approximately 100 acres above mean higher high water (MHHW) (Figure 1).

Construction of the navigational channel in Everett Harbor from 1894 to 1903 resulted in large volumes of sediment requiring disposal. Creation of the Jetty Island began in 1903 with construction of a rock jetty behind which these dredged materials could be placed. Maintenance of the channel and placement of the dredged material to build the island continued until 1969 (USACE 2001). In the 1980's the Corps realized an opportunity to increase the area of habitat created on Jetty Island by continuing to beneficially use dredged material from the downstream settling basin and navigation channel. Dredged material was placed along the western portion of the island in the winter of 1989 as a berm to protect the island from erosion. Once this berm was created, a 19-acre mudflat formed within the protected embayment on what had been the sandy west shore of the island. The berm thus created valuable mudflat habitat for benthic infauna and epibenthic crustaceans that provide prey species for juvenile salmon, Dungeness crab, and shorebirds as a part of Jetty Island.

American dunegrass (*Elymus mollis*) plantings in 1990, both from nursery stock and plants dug on the island, were originally very successful and continued to expand and infill between the planted rows along the west side of the top of the berm. While much of the area originally planted with dunegrass eroded away, it appears that the rhizomatous root mat of the grass was helpful at retarding some erosion. Dunegrass has colonized both sides of the berm, as well as the top of the berm, and has spread out to the tip of the island. The eastern intertidal edge of the berm supports typical low saltmarsh vegetation including *Salicornia* and *Distichlis*. The top of the berm currently supports black cottonwood saplings, Scot's broom (*Cytisus scoparius*), and evergreen blackberry (*Rubus laciniatus*) patches. To the west of Jetty Island lies an extensive system of intertidal mudflats, a large eelgrass meadow, and Possession Sound. The Snohomish River estuary, Port Gardner, the federal navigation channel, and the City of Everett lie to the east (Figure 1).

1.2 Project Location and Description

The dredging activities proposed for FY 2004 through FY 2008 are a component of the Everett Harbor and Snohomish River Federal Navigation Project, providing maintenance of the navigation channel and settling basins in the lower Snohomish River (Figure 1). Without annual maintenance dredging, shoaling would lead to a shallower channel that would reduce the ability of large ships to enter and leave safely. This BA addresses proposed dredging and disposal activities for fiscal years 2004 through 2008.

The Corps proposes to dredge the lower and upstream settling basins on alternate years as conditions warrant (Figure 2). Based on a condition survey conducted in March and April 2003, the Corps proposes to dredge approximately 261,00 cubic yards of sediments from the

downstream settling basin and approximately 15,897 cubic yards of sediment from the navigation channel just upstream of the downstream settling basin by clamshell dredge in FY 2004, and dispose of the sediments by bottom-dump barge at the WDNR managed PSDDA open water site in Port Gardner (Figure 1), provided it passes all criteria for open water disposal. The PSSDA site in Port Gardner is located at 47 degrees 58.86 minutes north latitude and 122 degrees 16.67 minutes west longitude (NAD27) (Figure 1). If the sediments are appropriate and needed, all or a portion of the sediments could be used beneficially to cap the Marine Sediment Unit (MSU) of the PSR Superfund site in Elliott Bay (Figure 3).

In FY 2005, the upstream settling basin and a portion of the channel just upstream of the upstream settling basin would then be dredged via clamshell and the approximately 200,900cubic yards of sediment used beneficially to cap the Marine Sediment Unit of the PSR Superfund site in Elliott Bay. The MSU site is located approximately 0.3 miles west of the mouth of the Duwamish River's West Waterway and is composed of five Remediation Areas (RAs). Dredged material from the proposed action could be used to cap RA5a and then RA5b within the MSU. The specific location and extent of areas RA5a and RA5b are illustrated in Figure 3. If sediments are needed at other beneficial use sites such as Jetty Island or other upland sites along the lower Snohomish River, sediments from the upstream settling basin and adjacent portion of the channel could be dredged via hydraulic pipeline to allow for direct placement of sediments at the beneficial use site.

All dredging and disposal activities will be performed between October 16 and February 14 of each fiscal year and will generally require approximately two to three weeks to complete. Disposal activities at the PSSDA open water site and the PSR Superfund site will be conducted in accordance with established criteria for these sites, as detailed in their respective Biological Assessments and concurrence letters (USACE 2000a and 2000c, USFWS 2000, NMFS 2000, NMFS 2003a, USACE and EPA 2002, USFWS 2003, NMFS 2003b).

Dredging and disposal activities would likely be repeated in fiscal years 2006 and 2007 in the lower and upstream settling basins, respectively, with the downstream settling basin then being dredged again in 2008 under this BA. Details from the annual condition survey would be used to determine the volume of material to be dredged from each location and the most appropriate disposal option would then be determined. The Corps would use the dredged sediments beneficially at the PSR Superfund site (if needed) or at a permitted upland disposal site in need of sediment if one were available. If beneficial use of the dredged sediment were unavailable, the sediment would be disposed of the sediment at a permitted open water disposal site (most likely the Port Gardner site).

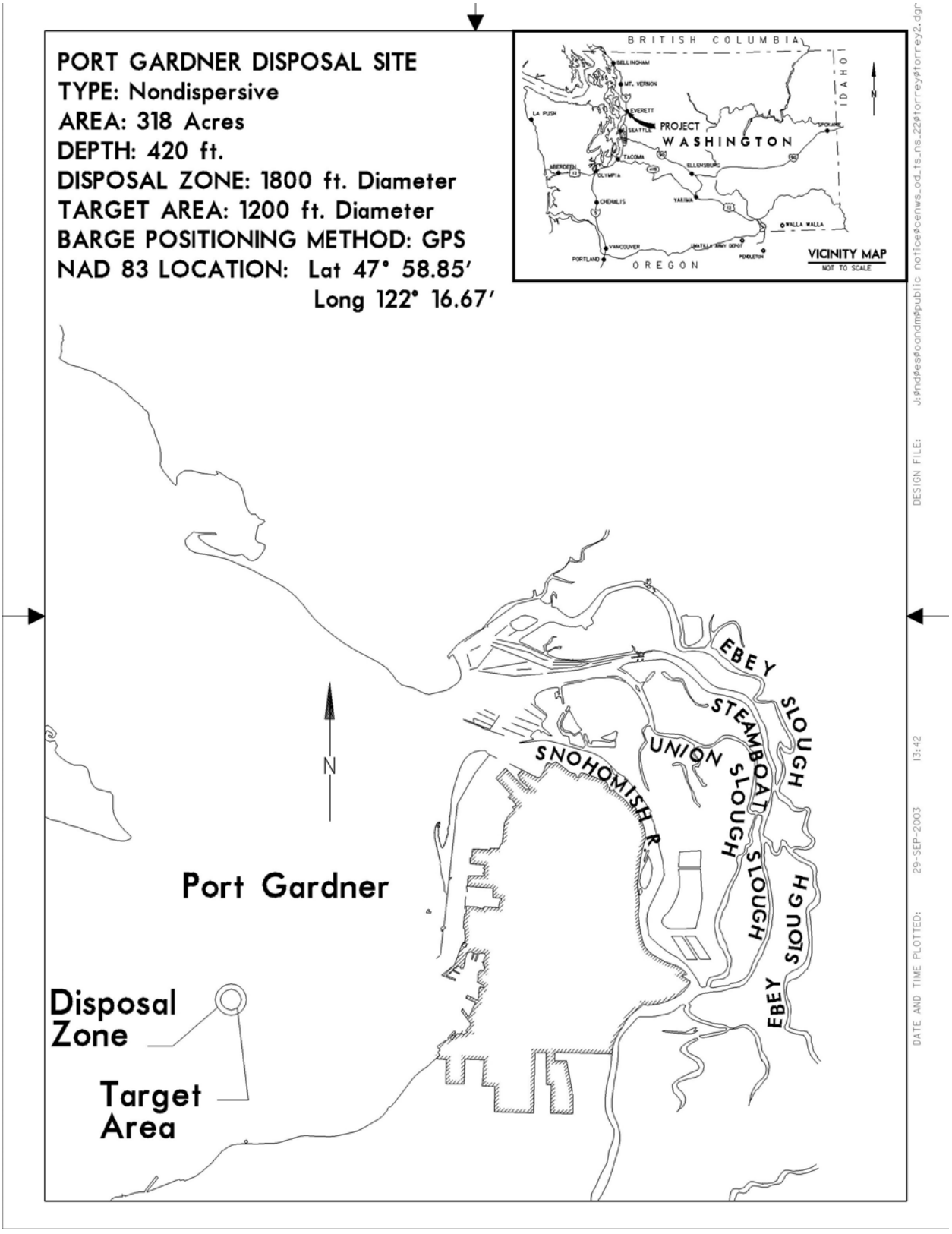

Figure 1: Vicinity Map, showing Snohomish River Estuary, Port Gardner, and PSSDA Site

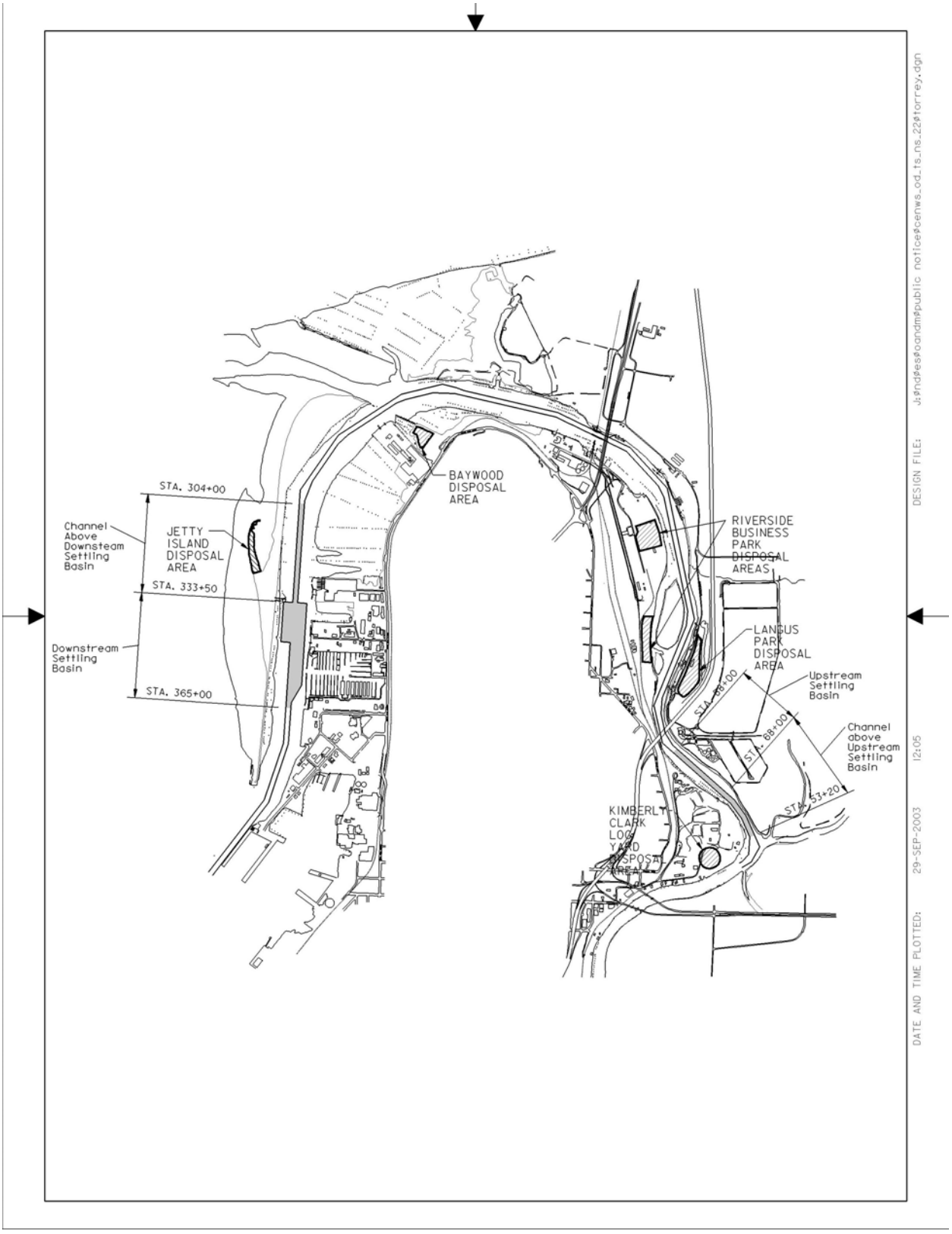

Figure 2: Location and extent of dredging in upper and downstream settling basins and location of disposal sites.

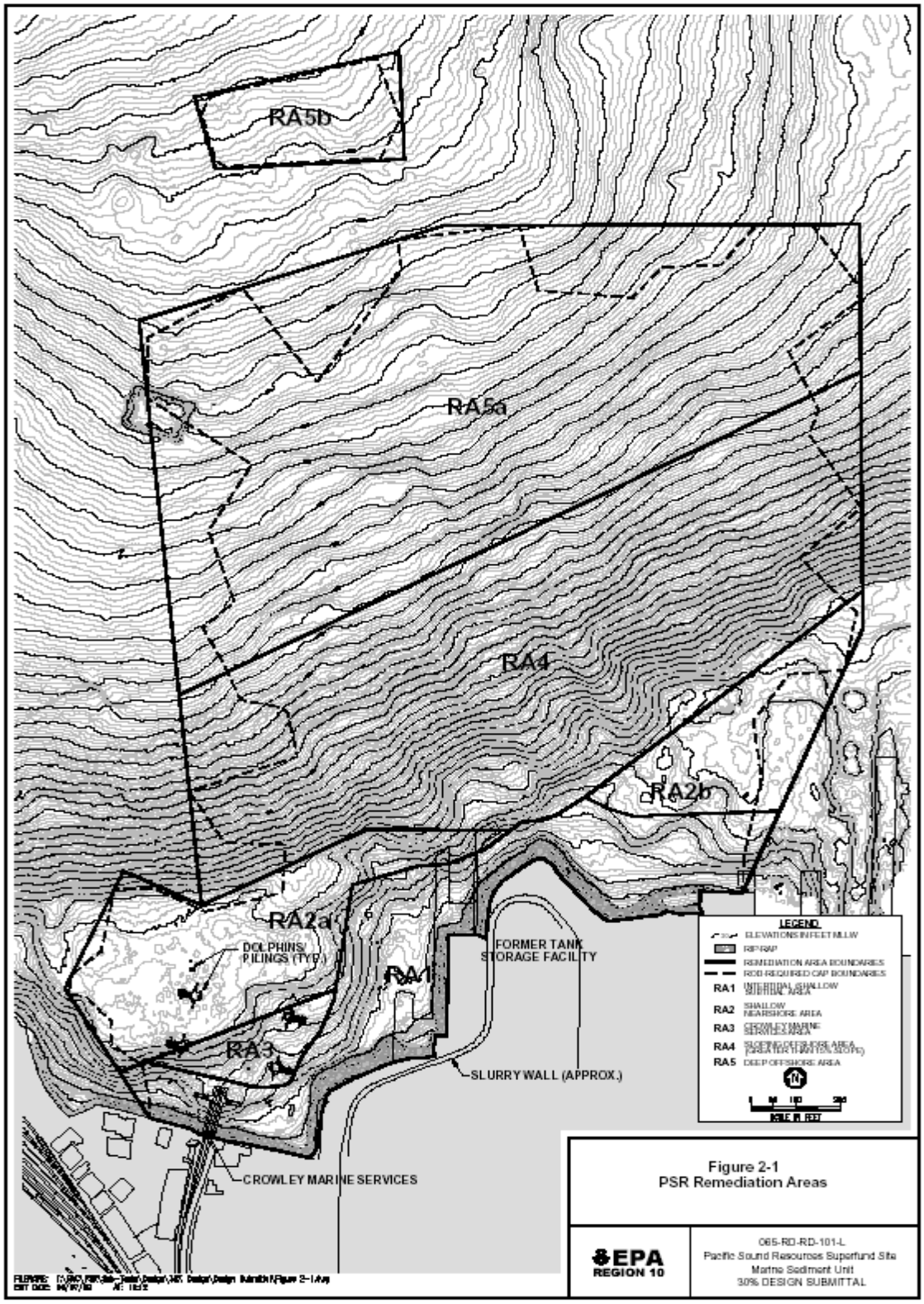

Figure 3: PSR Superfund site, MSU Remediation Areas 5a and 5b locations and extent

1.3 Definition of Action Area

The action area, i.e., the area affected directly or indirectly by the dredging project, is defined as the lower Snohomish River, Jetty Island and its adjacent habitats, and Port Gardner Bay (Figure 1). The action area also includes the southern end of Elliott Bay where the potential beneficial use of dredged sediment for capping the Marine Sediment Unit of the PSR Superfund site could take place (Figure 3).

The navigation channel within the Snohomish River extends upstream approximately 6.3 miles at a depth of 8 feet and a width of 150 feet (Figures 1 and 2). The Snohomish River estuary itself is approximately 9 miles long and three to four and a half miles broad at its widest point. The shoreline along the lower Snohomish River is moderately developed with maritime industry, commercial recreation and undeveloped areas of intertidal and freshwater wetlands and associated uplands.

The Port of Everett is a major exporter of logs to Asia, and the Port also supports the U.S. Naval Station Everett, home to the USS Abraham Lincoln, numerous support ships, and some 2,400 naval personnel. The Everett Marina at the southern end of the navigation channel is the largest in the Pacific Northwest and the second largest on the west coast, supporting some 2,300 boats. The downstream settling basin is immediately west of the Everett Marina (Figure 1).

The navigation channel is thus subject to intense marine traffic ranging from commercial vessels, and recreational boaters, to sports anglers and hand-launch kayakers and canoeists. While much of the intertidal zone has been historically diked and drained to accommodate agricultural and commercial development, large areas of undeveloped habitat remain on the estuary's six major islands, particularly on Spencer, Otter, and South Ebey Island, all of which are located upstream of the upstream settling basin (Figure 1).

2.0 DESCRIPTION OF PROJECT AREA AND ACTION AREA

2.1 Snohomish River and Estuary

The Snohomish River basin has a varied topography, ranging from the western intertidal lands, to steep cliffs in the eastern foothills of the Cascade Mountains and draining some 1,978 square miles of land. Although forests cover approximately 82 percent of the basin, agricultural lands predominate throughout the coastal lowlands and extend inland along the alluvial river bottoms. The approximately 1,900 acres of the lower river basin was historically almost totally wetland (USACE 1991). Much of the historic intertidal and freshwater wetlands of the floodplain have been diked and drained for agriculture and flood control. Agricultural diking, wetland loss, and the reduction of large woody debris supply to the lower river are implicated in the decline of the basin's salmonid stocks. Logging and clearing for agricultural/residential development continue

to impact the lower Snohomish River and estuary. Nearly all the upland area in the project vicinity is now used for industrial, commercial, residential, or agricultural purposes. In many instances, urban land use has been made possible by conversion of wetlands to uplands using dredged material as fill.

The Snohomish River is formed by the confluence of the Snoqualmie and Skykomish Rivers about 22 miles southeast of Everett, Washington. The river enters Puget Sound at Everett about 30 miles north past the City of Everett, then curves westward to enter Puget Sound via Port Gardner Bay (Figure 1). The river has an approximate mean annual flow of 9,951 cubic feet per second (as measured at Monroe in 1985). Most of the larger sediments have been deposited in the middle river, and the lower river has primarily a sand and mud substrate.

The lower Snohomish River estuary is approximately 9 miles long and three to four and a half miles broad at it's widest. It is an area of very low gradient with a sinuous, meandering main channel and three main distributary channels (Steamboat, Union, and Ebey Sloughs) spread over the broad delta floodplain (Figure 1). Lower reaches of the Snohomish River, as well as Ebey, Steamboat, and Union Sloughs, and their associated complex of wetlands are estuarine areas under saltwater influence. These sloughs create islands within the river delta which are generally undeveloped, publicly owned, and are managed for the benefit of fish and wildlife. The habitats along the Snohomish River and within it's estuary function as a wildlife corridor linking urban and rural open spaces from the foothills of the Cascade Mountains to the Puget Sound lowlands and adjacent waters. In a 1994 study by the City of Everett, 71 bird species, 15 mammal species, and three reptile/amphibian species were observed in the estuary.

Dredging of the mouth of the estuary and construction of Jetty Island by the Corps began in the late 1800's and early 1900's to facilitate the commercial navigation, timber related industries, and the industrial development that characterizes the lower river today. The consequence on the environment of these actions has been moderate degradation of the lower Snohomish River and estuary through a combination of levees, channelization, and the destruction of the intertidal habitats in the estuary, including the loss of approximately 50 percent of the area of intertidal mudflat (Pentec Environmental 1992).

The downstream settling basin (sometimes referred to as a turning basin) was developed by the Corps to catch sediment and reduce the frequency of dredging required to maintain safe navigation in the lower Snohomish River. The basin is approximately 700 feet wide, 1,200 feet long, and 20 feet deep; the channel to the south narrows to a width of approximately 425 feet, then narrowing further to ultimately meet the 150-foot wide navigation channel at a depth of 15 feet (Figure 2). The navigation channel extends upstream from the downstream settling basin for a distance of approximately 5.3 miles at a depth of 8 feet and a width of 150 feet. The upstream settling basin is approximately 150 feet wide, 2,112 feet long, and is usually dredged to a depth of 30 feet deep (although its authorized depth is 40 feet deep). The navigation channel extends upstream from the upstream settling basin for another approximately 0.5 miles at a depth of 8 feet and a width of 150 feet (Figure 2).

2.2 Jetty Island and Offshore Eelgrass Beds

Creation of the Jetty Island began in 1903 with construction of a rock jetty behind which dredged materials from the navigation channel could be placed. Maintenance of the channel and placement of the dredged material to build the island continued until 1969. In the 1980's the Corps increased the area of habitat created on Jetty Island by continuing to beneficially use dredged material from the downstream settling basin and navigation channel. The Corps and the Port of Everett placed approximately 323,000 cubic yards of clean sediment along the western portion of the island from October through December 1989 as a 1,500-foot long berm to balance erosion losses from the west side of the island and to create protected intertidal marsh and mudflat habitat. The berm was planted in the spring of 1990 and again in 1991 with native saltmarsh vegetation (above +9 feet MLLW). Subsequent natural colonization of salt-tolerant upland plant species has also occurred above +12 feet MLLW. Once this 15-acre berm was created, a 19-acre mudflat formed within the protected embayment (Pentec Environmental 2000). A natural sand spit and an area of saltmarsh also subsequently formed off the northern tip and eastern side of the berm.

Monitoring by Pentec Environmental (Pentec) from 1990 through 1995 demonstrated that the berm had created functional habitat as evidenced by: a higher abundance of epibenthic zooplankton (i.e. juvenile salmonid prey species) inside the depositional mudflat formed by the berm, juvenile salmon and juvenile surf smelt use of the area during high tides, and migrating shorebirds intensively using the mudflat (Pentec 2000). The berm thus created valuable mudflat habitat for benthic infauna and epibenthic crustaceans, which improved the food supply and habitat value of Jetty Island for juvenile salmon, forage fish, and shore birds.

However, since there is no natural source of sediment to nourish the berm, the life of the berm and the habitat it protects is limited without periodic replacement of eroded material with new sediment. The area of saltmarsh that had developed inside of the sand spit was largely obliterated in 1997 during overtopping storms that deposited over two feet of sand onto the marsh. In January 1998, the Corps placed an additional approximately 81,000 cubic yards of clean sediment from maintenance dredging on the berm (top of bank to the +5 to +6 foot contour) to partially address overtopping by storms (Pentec 2000). However, the quantity of material placed in 1998 was insufficient to replace all the material that had eroded, particularly along the northern half of the berm. As of 1999, the berm had lost an estimated 98,000 cubic yards of sediment. Approximately 10 percent (or 10,000 cubic yards) of sediment was transported northward and deposited on the distal end of the berm. The rest of the sediment (approximately 80,000 cubic yards) was presumably carried offshore. Fortunately, the winter of 1999 to 2000 was unusually mild and little additional erosion was experienced along the berm during that time. By summer 2000, the berm showed a loss of material from its outer half and additional nourishment was planned to maintain the integrity of the berm and the habitat values that had developed within the sheltered lagoon it forms (Pentec 2003). Between January 14 and 18, 2002, approximately 30,000 cubic yards of material from the channel upstream of the downstream settling basin was hydraulically placed on Jetty Island for renourishment of the berm. Sediment was placed in a configuration that preserved the existing area of mudflat and saltmarsh habitat while widening and strengthening the berm, but not extending its length (Pentec 2003). Continuing renourishment of the berm will be necessary to prevent the gradual erosion of the berm and to thus maintain the habitats created by the berm.

A large eelgrass meadow exists off the west shore of Jetty Island. Pentec estimated that the area west of Jetty Island which could support eelgrass was approximately 1,284 acres in size, based on preliminary video mapping (Pentec 1996). A photographic and underwater video mapping effort conducted in 2000 (Pentec 2001) showed that the largest continuous eelgrass meadow lies just west of the south end of Jetty Island. Eelgrass to the west and north of this area consists of discontinuous patches that are divided by meandering distributary channels of the Snohomish River as it flows over its delta at low tide (Pentec 2003).

2.3 Alternative Disposal Sites

2.3.1 Port Gardner Bay PSSDA Site

Depending on the results of sediment analysis and field determinations made by the Interagency Dredge Material Management Office, the sediment dredged from the downstream settling basin would be disposed of at the Port Gardner Bay PSSDA site. The Port Gardner disposal site is located 2 nautical miles west of the Everett Harbor (Figure 1). The 318-acre site is circular with a diameter of 4,000 feet. The depth of this site is 420 feet. The site is relatively flat, with slopes of less than 1 foot vertical over a horizontal distance of 200 feet. Currents are weak at this depositional site and move predominantly northward to westward. Pre-disposal sediment at the site was predominantly medium and fine silt with greater than 15% clay. Large polychaetes and bivalve mollusks dominate the benthic infauna at the Port Gardner site (USACE 2000a and 2000b).

2.3.2 Jetty Island Berm

Due to its grain size, sediment from the channel just upstream of the downstream settling basin has been beneficially used to provide sediment renourishment to the berm on Jetty Island and is the most likely dredging area to provide sediment for subsequent renourishment efforts. The Corps and the Port of Everett placed approximately 323,000 cubic yards of clean sediment along the western portion of Jetty Island from October through December 1989 to create a 1,500-foot long berm to balance erosion losses from the west side of the island and to create protected intertidal marsh and mudflat habitat. Once this 15-acre berm was created, a 19-acre mudflat formed within the protected embayment (Pentec Environmental 2000). A natural sand spit and an area of saltmarsh also subsequently formed off the northern tip and eastern side of the berm. The history and current conditions of Jetty Island were described in more detail in Section 2.2.

2.3.3 PSR Superfund Site

Depending on the results of sediment analysis and field determinations made by the Interagency Dredge Material Management Office, the sediment dredged from the upstream settling basin and adjacent channel may be beneficially used to cap a portion of the Marine Sediments Unit (MSU)

within the PSR Superfund Site in Elliott Bay. The PSR Superfund site lies within Elliott Bay, near the center of Puget Sound Basin and directly offshore of the City of Seattle. The MSU is located approximately 0.3 miles west of the mouth of the Duwamish River's West Waterway and is composed of five Remediation Areas (RAs). Dredged material from the proposed action could be used to cap RA5a and then RA5b within the MSU. The specific location and extent of areas RA5a and RA5b are illustrated in Figure 3.

The Marine Sediment Unit (MSU) within the PSR Superfund site encompasses approximately 66 acres of Elliott Bay (Figure 3). Bottom depths within the MSU range from intertidal to over 200 feet deep, with a steeply sloped configuration ranging from 6 to 20 (or greater) percent slope. The steepest slopes are near shore, and slopes gradually decrease with increasing distance offshore. Tidal elevations range from extreme low water at –4 feet mean lower low water (MLLW) to extreme high water at +14.8 MLLW. Remediation Areas 5a and 5b (which may be capped with the dredged material) extend from approximately –140 to –240 feet MLLW and include slopes with approximately 4 percent to 15 percent grades. Circulation within Elliott Bay is driven principally by tidal forces, modified somewhat by the effects of winds, salinity and temperature differentials.

2.3.4 Alternative Upland Disposal Sites

Sediment dredged from the upstream settling basin and channel could be used if needed at several previously utilized upland disposal sites, including the Langus Riverfront Park Rehandling site, the Kimberly Clark Log Yard, the Baywood site, and the Port of Everett's Riverside Business Park site (Figure 1). These upland sites are all located along the lower Snohomish River and have beneficially used dredged sediments from the upstream settling basin and adjacent upstream portion of the navigation channel in the past. The future use of these sites is dependent upon the need for materials at these sites, the availability of suitable material within the settling basin, and the availability of permits.

DESCRIPTION OF PROPOSED ACTIONS

3.1 Dredging

The proposed actions include dredging and disposal operations to be performed over a five year time period, extending from FY 2004 through FY 2008. The downstream settling basin and a portion of the navigation channel just upstream of the lower basin would be dredged in FY 2004 and the upstream settling basin and a portion of the channel just upstream of the upper basin would be dredged in FY 2005. Dredging activities would alternate between the lower and upper basins (and their associated portions of the navigation channel) every other year thereafter for the duration of this proposal (i.e. the lower basin in 2006 and 2008; the upper basin in 2007). The FY 2004 through 2008 dredging and disposal activities will be performed only between October 16 and February 14 of each fiscal year to minimize disturbance to migrating and juvenile

salmonids (or during other windows as may be determined by the Services in the future) and will generally be accomplished within approximately two to three weeks.

Details regarding the anticipated volumes of dredged materials, the types of equipment used, and the proposed use or disposal of the dredged sediment are determined based on condition surveys conducted in the spring prior to the proposed dredging. Therefore, only the proposed FY 2004 and 2005 dredging activities are described in detail below, based on the condition survey conducted between March 28 and April 3, 2003. However, the Corps anticipates that the subsequent dredging of the lower basin again in 2006 and 2008 and of the upper basin in 2007 would be conducted in a substantially similar manner as that described below for the FY 2004 and 2005 dredging.

Similarly, while the specifics of daily total loads, total days worked, and exact daily schedule are generally decided by the contractor at the time of dredging, the Corps anticipates that the FY 2004 through 2008 dredging will be conducted in a manner similar to the previously permitted 2001 and 2002 dredging described below in Section 3.1.2.

3.1.1 FY 2004 Dredging of the Downstream settling basin and Adjacent Channel

The downstream settling basin would be dredged in FY 2004 (between 16 October 2003 and 14 February 2004) using clamshell equipment and then loading the dredged materials onto a bottom-dump barge. Clamshell dredges have a hinged bucket of steel with a 'clamshell' shape that is suspended from a crane mounted on a barge. During the dredging operation, an anchoring system of wire and anchors or spuds with or without tugs is used to control the position of the barge. The bucket is lowered to the sediment surface with the jaws open. When the force of the bucket weight hits the bottom, the clamp grabs a section of the sediments. As it is hoisted up through the water column, the jaws close carrying sediments to the surface. The sediments are then placed on a bottom-dump barge for transport to the disposal site.

The downstream settling basin will be dredged between stations 333+50 to 345+50 to a required depth of 20 feet (plus 2 feet overdepth); the basin then narrows to meet the channel and will be dredged between stations 345+50 and 365+00 to a required depth of 15 feet (plus 2 feet overdepth) (Figure 2). The total estimated volume available from the downstream settling basin is approximately 261,00 cubic yards, including overdepth. The sediments from the downstream settling basin will be transported to the PSSDA open water disposal site in Port Gardner by bottom-dump barge. Results from testing to determine sediment suitability for PSSDA disposal are expected by the end of December 2003. If needed and appropriate for use, the dredged sediments could be transported to the PSR Superfund site by bottom-dump barge and used to cap the Marine Sediment Unit.

The portion of the navigation channel just upstream of the downstream settling basin would also be dredged in FY 2004 (between 16 October 2003 and 14 February 2004) by clamshell dredge and the sediments transported to the PSSDA open water disposal site in Port Gardner by bottom-dump barge. The portion of the channel just upstream of the downstream settling basin will be dredged between stations 304+00 to 333+50 to a required depth of 8 feet (plus 2 feet overdepth) for an approximate volume of 15,897 cubic yards of sediment (Figure 2). If needed and

appropriate for use, the dredged sediments could be transported to the PSR Superfund site by bottom-dump barge and used to cap the Marine Sediment Unit.

3.1.2 FY 2005 Dredging of the Upstream settling basin and Adjacent Channel

The upstream settling basin and a portion of the navigation channel just upstream of the upper basin would be dredged in FY 2005 (between 16 October 2004 and 14 February 2005) using clamshell equipment and the sediment most likely transported to the PSR Superfund site (specifically to the Marine Sediment Unit areas 5a and 5b) by bottom-dump barge (Figures 2 and 4). Including the channel and the upstream settling basin, the total estimated volume available for dredging is approximately 200,900 cubic yards. If the sediment were not appropriate for use or was not needed at the PSR Superfund site, the dredged sediment would be disposed of at the PSSDA open water disposal site in Port Gardner Bay (Figure 3).

The upstream settling basin would be dredged between stations 68+00 and 88+00 to a required depth of 30 feet (plus 2 feet overdepth) for an approximate volume of 191,613 cubic yards (Figure 2). The portion of the channel just upstream of the upstream settling basin would be dredged between stations 53+00 to 68+00 to a required depth of 8 feet (plus 2 feet overdepth), for an approximate volume of 9,288 cubic yards.

3.1.3 Previously Permitted Dredging of Lower and Upstream settling basins

The upstream settling basin was last dredged from 21 to 29 January 2002 by hydraulic pipeline dredge between stations 42+00 and 86+00. That operation removed approximately 143,000 cubic yards of sediment, which was beneficially used at the Port of Everett's Riverside Business Park site. The channel upstream of the downstream settling basin was last dredged by hydraulic pipeline dredge on 14-18 January 2002. The approximately 47,000 cubic yards of material from the channel area was directly placed on Jetty Island for renourishment of the berm (Pentec 2003). Both of these dredging actions were permitted based on an August 2001 BA (USACE 2001), for which the Corps received concurrence from USFWS on 16 October 2001 (USFWS 2001). NMFS had previously extended concurrence in their 26 May 1999 letter for the entire dredging period described in the FY 1997-2001 Public Notice (NMFS 1999a).

The downstream settling basin was last dredged from 15 January to 8 February 2001 by clamshell between stations 333+50 to 345+50. That operation removed approximately 270,148 cubic yards of sediment, 248,800 cubic yards of which were disposed of at the PSDDA open water disposal site in Port Gardner Bay; 21,200 cubic yards of the dredged sediment were beneficially used at the Riverside Business Park site. The dredging action in the downstream settling basin with disposal at the Port Gardner Bay PSDDA site was ultimately permitted based on verbal authorization of USFWS (personal communication with Mr. Fred Seavey, USFWS). NMFS had previously extended concurrence for the entire dredging period described in the FY 1997-2001 Public Notice in their 26 May 1999 concurrence letter (USFWS 1996).

3.1.4 Anticipated Approximate Volumes and Physical Extent of Dredging

3.1.4.1 FY 2004 - Downstream settling basin and Channel

Based on a channel condition survey of 28 March and 3 April 2003, the proposed FY 2004 dredging operations are expected to remove approximately 276,494 cubic yards of subtidal river sediment from the downstream settling basin and channel (between stations 333+50 to 365+00) and the portion of the channel immediately upstream of the basin (between stations 304+00 to 335+50). This area encompasses approximately 6,100 linear feet (Figure 2). No intertidal areas would be dredged. The existing intertidal areas would be retained along the outer edges of the navigation channel and the downstream settling basin during and after dredging is accomplished to maintain existing habitat and offer a movement corridor for fish and wildlife during as the dredging operation proceeds through the basin and the channel.

An approximately 400-foot wide intertidal area would be retained along both banks of the navigation channel during and after dredging. This area extends between the outer edge of the dredged channel and Jetty Island to the west of the navigation channel and between the more developed shorelines of the Everett Marina, the 12th Street Channel, and the Everett Naval Station on to the east of the outer edge of the navigation channel. Approximately 100 feet of intertidal area would be retained along the outer-most (western) edge of the widest portion of the downstream settling basin and approximately 200 feet of intertidal area would be retained along the outer-most (western) edge of the narrowing portion of the downstream settling basin. Similarly, approximately 200 feet of intertidal area would be retained along the entire eastern edge of the downstream settling basin. Because only developed shoals would be dredged within the settling basin, dredging may not actually occur to the extreme outer edge of the settling basin based on the shoals indicated on the 2003 condition survey.

The required dredge elevation within the downstream settling basin is –20 feet MLLW, with an allowable over-depth of two feet below the required dredge depth (i.e. to –22 feet MLLW). The required dredge elevation within the channel downstream of station 363+50 is –15 feet MLLW, with an allowable over-depth of two feet below the required dredge depth (i.e. to –17 feet MLLW). The required dredge elevation within the channel is –8 feet MLLW with the same allowable over-depth of two feet (i.e. to –10 feet MLLW). The volume of the allowable over-depth has been included in the approximately 276,494 cubic yard estimate of the total dredged volume for the downstream settling basin and adjacent channel. Side slopes along the edge of the dredged portion of the channel would be approximately 2:1 slopes after dredging.

3.1.4.2 FY 2005 - Upstream settling basin and Channel

Based on a channel condition survey of 28 March and 3 April 2003, the proposed FY 2005 dredging operations are expected to remove approximately 200,900 cubic yards of river sediment from the upstream settling basin (between stations 68+00 and 88+00) and the adjacent channel. This area encompasses approximately 3,500 linear feet of channel (Figure 2). An intertidal area with variable widths between 50 and 150 feet wide would be retained along both banks of the upstream settling basin and navigation channel in this area during and after dredging. This area extends between the outer edge of the dredged channel and the shoreline of the Kimberly Clark Log Yard property to the west and the shoreline of the Everett Sewage Treatment facilities to the

east of the outer edge of the navigation channel and settling basin. Because only developed shoals would be dredged within the settling basin, dredging may not occur to the extreme outer edge of the basin based on the shoals indicated on the 2003 condition survey.

The required dredge elevation within the basin is –30 feet MLLW, with an allowable over-depth of two feet below the required dredge depth (i.e. to –32 feet MLLW). The required dredging elevation within the channel is –8 feet MLLW, with an allowable over-depth of two feet below the required dredge depth (i.e. to –10 feet MLLW). The volume of this over-depth has been included in the approximately 200,900 cubic yard estimate of the total dredged volume for the upstream settling basin and adjacent portion of channel. Side slopes along the edge of the dredged portion of the channel would be approximately 2:1 slopes after dredging.

3.1.4.3 FY 2006 through 2008 Dredging

Because the volume of dredged sediment is determined based on annual condition surveys conducted prior to the dredging, it is not possible to exactly predict the volume of material that would need to be dredged during FY 2006 through 2008. Shoaling rates and depths depend on river flows and sedimentation rates that are driven by seasonal rainfall. However, the volume dredged in during the FY 2006 through FY 2008 period would be conducted in the same manner, within the same time window, and with the same conservation measures (as described in Section 6.5.5 and 6.6.5) as the FY 2004 and 2005 dredging described above. Total volumes dredged between FY 2004 and 2008 would not exceed the permitted maximum of 800,000 cubic yards from the downstream settling basin, 500,000 cubic yards from the upstream settling basin, and 200,000 cubic yards from the navigation channel, as presented in Public Notice CENWS-OD-TS-NS-22.

Therefore, we expect similar effects to listed species over the proposed FY 2004 through 2008 dredging period (see Sections 5.0 and 6.0). However, if new species are listed, new information regarding the distribution or range of listed species becomes available, or if the dredging proposal changes from that presented herein (including the use of hydraulic dredging for upland disposal or renourishment of Jetty Island), the Services would be updated with the new information in order to ensure that continued concurrence with the effect determinations made herein.

3.2 Disposal

3.2.1 PSSDA Open Water Disposal

The downstream settling basin and portions of the channel immediately upstream of the basin would be dredged using clamshell equipment in FY 2004 and the sediment transported to the PSSDA open water disposal site by bottom-dump barge. The total estimated volume available from the downstream settling basin and channel is approximately 276,494 cubic yards. Results from testing to determine sediment suitability for PSSDA disposal is expected by the end of December 2003. If the sediment were needed at the PSR Superfund site, the dredged sediment could be used beneficially to cap the Marine Sediment Unit in Elliott Bay (see Section 3.2.2).

Both the lower and upstream settling basins and adjacent portions of the navigation channel are considered 'low ranked' areas for contaminates. When this material was previously tested in accordance with the Dredged Material Management Office's PSSDA protocols in September 1996, the Dredged Material Management Plan Agencies concluded that all the material was suitable for placement at the Port Gardner Bay PSSDA open water disposal site. The Corps Dredged Material Management Office will sample sediments from within the proposed dredging areas (Figure 2) according to the PSSDA protocols the week of September 22, 2003; these samples will subsequently be tested to determine whether the sediment meets the standards for disposal at the PSSDA site, as well as the Washington State Department of Ecology's Sediment Management Standards (SMS) and Atterberg Limits for use as capping material at the PSR Superfund site (see Section 3.2.2). The sediment characterizations from the September 22, 2003 sampling have a 'recency frequency' of seven years; contaminate testing prior to dredging will be required again in 2010.

If the sediment meets the standards for PSSDA disposal, the dredged sediment would then be disposed of at the WDNR-managed PSDDA open water, non-dispersive site in Port Gardner Bay (Figure 1). If samples from any individual dredge area were found unsuitable for unconfined open water disposal at the PSSDA site, the sediment from within that dredging area would not be dredged under this proposed action. The future disposal of any such sediment would be addressed as a separate action and a separate BA would be prepared.

Disposal activities will be conducted in accordance with established criteria for either the PSR Superfund or the PSSDA sites. Effects of the disposal actions are analyzed in the Biological Assessment previously prepared by the Corps, and have been accepted by NOAA Fisheries and USFWS as described in their respective concurrence letters (USACE 2000a and 2000c, USFWS 2000, NMFS 2000, NMFS 2003b). Therefore, the following sections of this BA present only a summary of the disposal actions and the effects described in those documents.

3.2.2 PSR Superfund Site and Marine Sediments Unit Cap

The upstream settling basin and a portion of the channel just upstream of the upper basin would be dredged using clamshell equipment and the sediment transported to the PSR Superfund site (specifically to the Marine Sediment Unit areas 5a and 5b) by bottom-dump barge. The approximate total volume of sediment available for capping MSU areas 5a and 5b is 200,900 cubic yards. If the sediment were not appropriate for use or not needed at the PSR Superfund site, the dredged sediment could be disposed of at the PSSDA open water disposal site in Port Gardner Bay (see Section 3.2.1).

The Pacific Sound Resources Superfund site, and its Marine Sediment Unit (MSU) is located approximately 0.3 miles west of the mouth of the Duwamish River's West Waterway within Elliott Bay (Figure 3). The site includes the area where the Wyckoff West Seattle Wood Treating facility existed, and contaminated the sediments in adjacent portions of Elliott Bay. The PSR site was listed on the Superfund National Priorities List in May 1994.

The Dredged Material Management Office will sample sediments from within the proposed downstream dredging areas (Figure 2) according to the PSSDA protocols the week of September

22, 2003; these samples will subsequently be tested to determine whether the sediment meets the standards for disposal at the PSSDA site, as well as the Washington State Department of Ecology's Sediment Management Standards (SMS) and Atterberg Limits for use as capping material at the PSR Superfund site. If the sediment samples meet both of these standards, dredged material from the upstream settling basin and adjacent portion of the channel would be used as capping material for Remediation Areas 5a and 5b of the MSU within the PSR Superfund Site (Figures 2 and 3). Sediments from the upstream dredging areas will be sampled in calendar year 2004 prior to the proposed dredging window.

The marine sediment cap is designed to do the following:

- Reduce the chemical flux from contaminated sediments and groundwater, and chemically isolate these sources from the benthic organisms that would be expected to recolonize the cap;
- Physically isolate the contaminated sediments and provide a clean habitat for benthic organisms;
- Maintain stability under static loads and have an acceptable reliability under design seismic loads;
- Resist erosion, suspension and transport of cap materials and underlying contaminated sediments by waves, tidal and wind induced currents, and propeller wash.

Confinement of contaminated marine sediments is accomplished by placement of a sediment cap that covers approximately 58 acres, approximately 22 acres of which is associated with Remediation Area 5 – Deep Offshore Area, sub-areas RA5a and RA5b (Figure 3). These areas extend from approximately -140 to -240 feet MLLW and include slopes with approximately 4 percent to 15 percent grades. Placement of cap material in RA5 can be accomplished in the most cost-effective manner by instantaneous bottom-dump placement of dredged material originating from routine maintenance dredging projects in local rivers.

The cap design, including cap thickness and material specifications, will be completed in accordance with the Guidance for In Situ Subaqueous Capping of Contaminated Sediments (EPA 905-B96-004). Capping material will be selected and placed in such a way as to provide appropriate habitat for the marine organisms natural to the area. The entire area that is capped will be designated a "no-anchor" zone, to prevent damage by commercial vessels using large "whale-tail"-type anchors. Dredging restrictions will be placed on any future work within the PSR-MSU site.

Disposal activities will be conducted in accordance with established criteria for the PSR Superfund site. Effects of the disposal actions are analyzed in the Biological Assessments previously prepared by the Corps, and have been accepted by NOAA Fisheries and USFWS as described in their respective concurrence letters (USACE and EPA 2002, USFWS 2003, NMFS 2003a). Therefore, the following sections of this BA present only a summary of the disposal actions and the effects described in those documents.

3.2.3 Renourishment of Jetty Island Berm

If renourishment of the Jetty Island Berm is needed within the FY 2004 through 2008 period covered by this BA, the portion of the navigation channel just upstream of the downstream settling basin could be dredged by hydraulic pipeline dredge and the sediments directly placed onto the berm for sediment renourishment. Sediment will be transferred to the site by laying the pipeline across the island to the berm, in a manner similar to previous sediment placements, including detailed consultation with the Services regarding extent, elevation, timing, and methods of placement. As during previous placements, earth-moving construction equipment would be used to shape the top and slopes of the berm after the material is placed. Care would be taken during placement of the pipeline and operation of the construction equipment to minimize impacts to existing dune and saltmarsh vegetation on the Jetty Island berm.

3.2.4 Beneficial Use on Upland Disposal Sites

If sediments are needed for the various upland disposal sites on the lower river (Langus Riverfront Park Rehanding, Kimberly Clark log yard, Baywood, or Port of Everett Riverside Business Park) within the FY 2004 through 2008 period covered by this BA, the portion of the navigation channel just upstream of the upstream settling basin could be dredged by hydraulic pipeline dredge and the sediments directly placed at one or more of these upland sites. Sediment will be transferred to the site by laying the pipeline to the site, in a manner similar to previous sediment placements, including detailed consultation with the Services regarding extent, elevation, timing, and methods of placement. As during previous placements at these sites, care would be taken during placement of the pipeline and operation of the construction equipment to minimize impacts to existing intertidal and upland vegetation.

The future use of these sites is dependent upon the need for materials, the availability of suitable material within the settling basin, and the availability of permits. The Corps will provide supplemental information to NOAA Fisheries and USFWS detailing the method of dredging, as well as the location, elevation, volume, and placement specifics of any future proposal to use dredged materials beneficially on Jetty Island or at any of the upland sites. This information would be provided as a supplement to this BA and would be based on a determination that a need exists for renourishment/upland placement and suitable material is available based on annual condition surveys within the navigation channel and settling basins, as conducted between fiscal years 2005 and 2008.

4.0 SPECIES AND HABITAT INFORMATION

This section describes the listed species considered in this BA and the habitat indicators important for their survival and recovery. Estuarine and marine habitats are emphasized, because of the potential effects of the proposed dredging and disposal actions on those types of habitat. This evaluation is loosely based on the types of guidelines developed by NOAA Fisheries to facilitate and standardize the determination of effects of projects/actions on listed anadromous salmonids (i.e. the NMFS Matrix of Pathways and Indicators 1996, the NMFS

concepts for salmon habitat in streams 1999b). However, as these tools were developed for freshwater environments, they are not directly applicable to estuarine or marine waters.

Therefore, the following discussion is organized around a set of modified indicator-based categories of habitat function developed from review of scientific literature and best professional judgment. This evaluation is thus generally qualitative in nature and is divided into three main pathways that address water quality, physical habitat quality, and biologic habitat quality. These indicator categories form the matrix of pathways that were used to establish the baseline condition in the project area and to then determine the potential effects of the proposed dredging and disposal actions on these baseline conditions (see Section 5.0).

4.1 Listed Species

Based on species lists provided by USFWS for previous rounds of maintenance dredging and the NOAA Fisheries website, the following species under the jurisdiction of USFWS and NOAA Fisheries are addressed in this BA:

Common Name	***Scientific Name***	**Federal Listing Status**	**Has Critical Habitat Been Designated?**
Bald Eagle	*Haliaeetus leucocephalus*	Threatened – July 12, 1995 Delisting proposed - July 6, 1999	No
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened – October 1, 1992	Yes, designated on May 24, 1996
Steller Sea Lion	*Eumetopias jubatus*	Threatened – November 26, 1990	No
Puget Sound/Coastal Bull Trout	*Salvelinus confluentus*	Threatened – November 1, 1999	No
Puget Sound chinook salmon	*Oncorhynchus tshawytscha*	Threatened – March 24, 1999	Yes, designated on February 16, 2000

Other Federally listed threatened or endangered species that may occur in Puget Sound include the humpback whale (*Megaptera novaengliae*; endangered) and leatherback sea turtle (*Dermochelys coriacea*; endangered). However, these species are extremely unlikely to occur within the lower Snohomish River, Port Gardner Bay, Jetty Island, or Elliott Bay (i.e. within the action area as defined in Section 1.3) based on extremely infrequent historic occurrences and a lack of typically utilized and appropriate habitat within the action area. These two species are

therefore not specifically evaluated in this BA as the proposed dredging and disposal activities would have *no effect* on these two species.

As noted previously, both USFWS and NOAA Fisheries (USFWS 2003, NMFS 2003a) have concurred with effect determinations for bald eagle, marbled murrelet, bull trout, and Puget Sound chinook salmon related to capping of the MSU portion of the PSR Superfund site, as presented in a Biological Assessment prepared for the PSR Superfund Site (USACE and EPA 2002). Similarly, both USFWS and NOAA Fisheries have also concurred (USFWS 2000, NMFS 2000) with effect determinations for these species related to disposal of dredged material at the PSDDA open water site at Port Gardner, as presented in the Programmatic Biological Evaluations prepared for the PSDDA Non-Dispersive Disposal Sites (USACE 2000a and 2000c). NOAA Fisheries has also concurred with Essential Fish Habitat consultation for the PSDDA open water disposal sites (NMFS 2003b).

Therefore, this BA addresses effects from the potential disposal of dredged materials at the PSSDA and PSR Superfund sites in a summary manner and references the more detailed material presented in the respective BA documents and concurrence letters. This BA focuses specifically on effects of the routine maintenance dredging in fiscal years 2004 through 2008 of the lower and upper basins and adjacent portions of the channel and addresses effects from the potential beneficial use of dredged material on the Jetty Island berm which may occur within the fiscal year 2004 through 2008 time period covered under this BA.

4.2 Baseline or Existing Environmental Conditions

The discussion below presents a synopsis of baseline indicators relevant to an analysis of effects from maintenance dredging and disposal operations. Because these indicators (water quality, physical habitat quality, and biological habitat quality) can directly effect fish populations (such as Puget Sound chinook salmon and bull trout), they can also affect higher order consumers that feed on fish, such as bald eagles and marbled murrelets.

4.2.1 Water Quality

Much of the water quality data was gathered from the WDOE water quality-monitoring gauge located at river mile 12.7 of the Snohomish River as it flows through the town of Snohomish at the bridge over the river on Avenue D (gauge #07A090). The Snohomish gauge is the closest gauge to the settling basins on the river and is located approximately 6.4 miles above the upstream settling basin. We reviewed water quality sampling gauge data since 1976 and compiled data records for stream flow, dissolved oxygen, temperature, and turbidity from within the proposed period of dredging (between October 16 and February 14) for the period spanning October 1976 to January 2002.

4.2.1.1 Water contamination

The Washington State Department of Ecology is responsible for setting water quality standards for surface waters of the State based on designated water uses and criteria. The waters of the

lower Snohomish River from the southern tip of Ebey Island at river mile 8.1 to the mouth have an 'aquatic life use' designation of "salmon and trout spawning, non-core rearing and migration" (WAC 173-201A-600, 602). This area encompasses the navigation channel, and both upper and downstream settling basins. The marine waters of Everett Harbor are designated as "good quality for salmon migration and rearing" (WAC 173-201A-610, 612).

The only portions of the lower Snohomish River on the Department of Ecology's 303(d) list of threatened and impaired waters are within the vicinity of the Riverside Business Park site in Sections 8 and 16 (Township 29 North, Range 5 East). Listed parameters in this area include a multitude of chemical contaminates and temperature. Pollutants within the Snohomish River are derived primarily from industrial point and non-point sources, storm water runoff from agricultural fields, and leakage of septic fields. The enforcement of total maximum daily load limitations for a number of parameters is expected to result in additional improvements in water quality.

4.2.1.2 Turbidity

The highest sources of turbidity within the navigation channel and the settling basins are the periodic pulses of sediment moving downstream within the Snohomish River from seasonal rainfall events and the natural mixing of fine-grained sediments suspended during the tidal cycle. Temporary pulses can also result from prop-wash from traffic within the marina and Everett Naval Station.

The water quality sampling gauge data (gauge # 07A090) indicates that the Snohomish River has variable suspended sediment levels within the proposed dredging period, reaching maximum levels in conjunction with maximum flows resulting from winter rainstorms. Average river flow within the time period of the proposed dredging has been 10,346 cubic feet per second (cfs), with maximum flows of 41,800 cfs, recorded on October 17, 1988. Suspended sediment levels generally reach their maximum between November and January, with pulses of high turbidity during February and early March storms (see below).

Average suspended sediment levels recorded during the window of the proposed dredging (October 1 through February 14) have been 7.4 NTU, including the highest readings of 51 NTU during the high flows of October 17, 1988 (see above), 31 NTU on November 28, 1977, and 27 NTU recorded on December 13, 1982. Lowest readings during the proposed dredging period have been 1 NTU, recorded five times during the month of October (1976, 1980, 1986, 1987, and 1992) and once in November (1976). Higher turbidity levels would be expected downstream of the monitoring station within the mixed waters of the estuary.

The Snohomish River is also characterized by sporadically high levels of suspended sediment occurring just after the end of the proposed dredging window (post February 14). Maximum suspended sediment levels recorded since 1976 include 100 NTU recorded on February 16, 1982, 90 NTU on February 20, 1995, and 86 NTU recorded on February 17, 1981.

4.2.1.3 Dissolved Oxygen

The water quality sampling gauge data (gauge # 07A090) indicates that the Snohomish River has generally high dissolved oxygen levels within the proposed dredging period, reaching maximum levels generally between mid-December and mid-February. Average dissolved oxygen levels recorded during the window of the proposed dredging (October 1 through February 14) have been 11.9 mg/L, including the highest readings of 13.5 mg/L on December 10, 1990, 13.3 mg/L on December 12, 2001, January 18, 1993, and January 23, 1984. Lowest readings during the proposed dredging period have been 9.6 mg/L, recorded on October 19, 1987. Dissolved oxygen levels between 9.0 and 10.0 mg/L have been recorded more commonly between July and September, corresponding with the lowest annual stream flows. The lowest recorded dissolved oxygen level (8.1 mg/L) was recorded on August 15, 1977.

4.2.1.4 Temperature

The water quality sampling gauge data (gauge # 07A090) indicates that the Snohomish River has fluctuating, but generally low water temperatures within the proposed dredging period. Average temperature recorded during the window of the proposed dredging (October 1 through February 14) was 6.4°C. The highest temperatures during the proposed dredging period have generally occurred in mid-October, with high temperatures of 14.1°C on October 6, 1980, 11.8°C on October 19, 1993, and 11.4°C on October 20, 1986. Lowest readings during the proposed dredging period have been 0.1°C, recorded on January 28, 1980. Temperatures greater than 17.5°C (lethal to developing fish embryos) have generally been recorded only during July – August. The highest recorded temperature (21.6°C) was recorded on August 15, 1977 (on the same date as the lowest recorded dissolved oxygen levels).

4.2.2 Physical Habitat Quality

4.2.2.1 Sediment contamination

Sediments from the portions of the lower and upstream settling basins and adjacent portions of the navigation channel to be dredged in FY 2004 and 2005 will be tested according to Puget Sound Dredged Disposal Analysis (PSDDA) protocol the week of September 22, 2003 (for the FY 2004 dredging and then in 2004 for the FY 2005 dredging). Once the sampling is completed, the results are anticipated within a few months of the sampling will be presented in a project-specific environmental assessment and Clean Water Act Section 404(b)(1) evaluation. Those results will determine how the dredged sediments can be used or disposed of, including beneficial use of the dredged sediments on Jetty Island or the Riverside Business Park site, for capping the MSU, or disposal at the PSDDA open water site in Port Gardner Bay, as discussed herein. Despite industrial pollution within the lower Snohomish River, previous rounds of PSDDA protocol sampling have determined that sediments from the lower and upstream settling basins and the navigation channel have been suitable for both beneficial use and PSSDA open water disposal.

There is a high degree of sediment contamination currently found within the PSR Superfund Site and the intertidal and subtidal habitats of the Marine Sediment Unit. The contamination is the result of relatively recent anthropogenic sources, principally the Wyckoff West Seattle Wood-Treating Facility in operation from 1909 until 1994. Sediments in the PSR-MSU are contaminated with polycyclic aromatic hydrocarbons (PAH) and other hazardous substances; contaminant levels far exceed sediment quality standards. Current remediation efforts intended to minimize human and benthic community exposure to contaminants, as well as the potential effects of these efforts on Federally listed fish and wildlife species are detailed in the Biological Assessment previously prepared for the PSR Superfund Site and the MSU (USACE and EPA 2002).

4.2.2.2 Shoreline and Estuarine Habitat Conditions

Much of the eastern shoreline of Port Gardner Bay (as well as the adjacent shorelines of Puget Sound) is almost exclusively armored (rip rapped). The existing shoreline banks are thin bands of mud- and sand-flats along the toe of the riprap. Common shoreline features also include constructed bulkheads and piers, principally for large commercial and industrial marine users.

The estuarine shorelines along the lower Snohomish River upstream of Preston Point are armored with riprap and pilings in many locations, but also contain areas with native mud banks. The southern portion of estuary is predominately characterized as fluvial freshwater and was historically a mosaic of tidal marshes, forested wetlands, and intertidal sloughs. Today these areas are predominately diked and in agricultural production. The exceptions being the southern end of Spencer Island (just upstream of the upstream settling basin), on which the dikes have been breached to restore tidal influence, and Otter Island that was never diked. The central portion of the estuary, located along either side of I-5 and parallel to the central portion of the navigation channel is characterized as fluvial brackish water and dominated by brackish tidal marshes and diked palustrine marshes. Wide shoreline mudflats are found along Steamboat and Ebey Sloughs and the majority of the eastern islands have broken dikes and are thus again subject to tidal inundation. Estuarine emergent marshes exist north of the navigation channel at the mouths of Ebey and Steamboat Sloughs and Quilceda Creek. Existing areas of estuarine marsh vegetation fringe the lower riverbanks within the vicinity of the Riverside Business Park site and the upstream settling basin, as well as the eastern shore of Jetty Island along the downstream settling basin.

Filling, dredging, and armoring have also diminished the extent and function of intertidal habitats around the PSR Superfund site and the Marine Sediment Unit. There are two pocket beaches at the head of the West and Main Slips along the shoreline of the PSR Superfund site that contain limited shallow subtidal aquatic habitats. There are no intertidal habitats present at the PSSDA open water disposal site in Port Gardner Bay due to water depths.

4.2.2.3 Disturbance/Noise

Due to the developed nature of Port Gardner Bay and the lower Snohomish River, these areas are subject to frequent and intense noise and disturbance associated with the commercial, maritime, and industrial facilities along the shoreline including marine traffic to and from the Everett

Marina and the Everett Naval Station. The lower end of the river is subject to recreational vessels of all types and sizes launching and mooring at the Everett Marina. Hand-launch vessels also frequent the lower estuary and sloughs near the upstream settling basin, but generate considerably less disturbance and noise than motorized vessels. Existing noise and disturbance levels are thus typically fairly high within the majority of the action area.

4.2.3 Biological Habitat Quality

4.2.3.1 Biological Resources

Biota utilizing habitats within the action area (the potential disposal sites in Elliott Bay, Port Gardner Bay, and the lower Snohomish River) include a variety of marine and aquatic invertebrates, estuarine and marine fish and shellfish, anadromous salmonids, birds, and marine mammals.

Invertebrates

Common marine invertebrates on the piling surfaces, riprap, and bulkhead areas of the Marine Sediment Unit include barnacles, tube-dwelling worms, sea anemones, sponges, tunicates, and mussels. Marine invertebrates documented or anticipated to utilize the offshore subtidal habitat of the MSU include a variety of polychaetes, clams, mussels, crabs, and shrimp. The benthic infauna at the PSDDA open water disposal site is dominated by large polychaetes and bivalve mollusks. Polychaetes make up 51 percent, mollusks 39 percent, and crustaceans only 4 percent of the biomass (USACE 2000b). Benthic infauna at the Port Gardner site are also dominated by large polychaetes and bivalve mollusks with polychaetes making up 50%, bivalves 42%, and crustaceans only 2.4% of the biomass (USACE 2000b). Other common invertebrates occurring in Elliott Bay and Port Gardner Bay include anemones, various shrimp, nudibranches, sponges, and sea cucumbers. Barnacles, bay mussels, limpets, and snails are typical invertebrates found on rocky or other hard intertidal substrata.

Pentec Environmental has documented invertebrate species assemblages within the lower Snohomish River (mainly downstream of the upstream settling basin) as part of their work for the Port of Everett (1992). Common invertebrate species (which are typically preyed upon by salmonids) include: snails (*Littorina* spp.), polychaetes (*Nereis* spp, *Notomastus* spp., *Nephtys* spp. *Glyceria* spp.), shore crabs (*Hemigrapsus* spp.), isopods (*Gnorimosphaeroma oregonensis*), ghost shrimp (*Callianassa* spp.), Dungeness crab (*Cancer magister*), and red crab (*Cancer productus*). Juvenile salmonids also prey preferentially on certain species of tiny crustaceans including amphipods (e.g.,*Corophium* spp., *Anisogammarus*, *Eogammarus*), some species of harpacticoid copepods (e.g., *Harpacticus uniremis*, *Tisbe* sp.), cumaceans, opossum shrimp, and midges (Chironomidae larvae) which are also common in the intertidal mudflats and marshes of the lower estuary.

Anadromous Salmonids

The use of both Port Gardner Bay and Elliott Bay (near the PSSDA disposal site and the Marine Sediment Unit) by salmonids is believed to be predominantly as a migration corridor into the main stem of the Snohomish and Duwamish Rivers, respectively. In-migrating adult salmon use deeper areas of Port Gardner Bay and Elliott Bay prior to moving into the rivers. However, some rearing and foraging by juvenile salmonids is likely, particularly in the limited shoreline areas with some structural diversity.

The Snohomish River and it's estuary support runs of seven salmonids: chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), and pink salmon (*O. gorbuscha*), as well as steelhead trout (*O. mykiss*), sea-run cutthroat trout (*O. clarki*), and native char (recently broken into two species - dolly varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*). All species spawn in freshwater upstream of the estuary, and adult use of the estuary (and therefore of the proposed dredging areas) is largely limited to migration and physiological transition from salt to fresh water. In contrast, juvenile salmonids depend on estuarine environments for migration, physiological transition from fresh to salt water, feeding, and refuge from predation and displacement during migration. There is considerable variation by species in juvenile residence periods in the estuary, with coho, chum, and chinook juveniles being relatively more dependent on the estuarine environment than pink, steelhead, sea-run cutthroat and native char, which quickly move through the estuary to marine waters.

Snohomish River coho salmon are considered depressed, while Skykomish, South Fork Skykomish, and Snoqualmie stocks are considered healthy (WDFW SASI 1994). Snohomish River coho spawn between late October and January and utilize almost all of the accessible tributaries draining into the Snohomish system, including: the Pilchuck River, Quilceda Creek and tributaries, French Creek, Allen creek and tributaries, Catherine Creek, Star Creek, Dubuque Creek, Panther Creek, Bunk Foss Creek, and Pilchuck Creek and tributaries, as well as in tributaries to the Skykomish River such as Woods Creek, the Wallace River, and the Sultan River. Juvenile coho salmon may spend a year in fresh water before moving into the estuary between March and May to feed in intertidal marshes and mudflats.

Snohomish River basin fall run chum are divided into Skykomish, Snoqualmie, and Wallace River stocks, all of which are considered healthy or unknown (WDFW SASI 1994). Chum salmon spawn between October and December, with peak around early to mid-November. Skykomish chum spawn in the mainstem Skykomish upstream at least to Proctor Creek and in the Pilchuck River; Snoqualmie chum spawn in the Snoqualmie River and the Tolt River, and may occur in other places as well; Wallace River chum spawn in the Wallace River at its tributaries including Olney Creek and Ruggs Slough (WDFW SASI 1994). Juvenile chum salmon are strongly associated with estuarine habitats, spending as little as 30 days in fresh water after emergence. Juveniles are generally present within the Snohomish River estuary from April through June where they feed in intertidal marshes and mudflats on a variety of insects, amphipods, and harpacticoid copepods.

Native char (bull trout and Dolly Varden) are believed to coexist in the Snohomish River drainage. Bull trout migrate and are captured throughout the inner bays of northeast Puget Sound from Possession Sound, Port Susan, Skagit Bay, Padilla Bay, out to Whidbey Island (F.

Goetz, USACE, unpublished data). Current information suggests that bull trout first enter tidally influenced waters in Puget Sound as age-2 fish. The seasonal timing of entry extends from mid-February to early September. Upon entry, the juvenile fish may elect to rear in the tidally influenced delta within intertidal marsh, distributary channels, or along mainstem habitat areas, or may pass through into nearshore marine areas. Larger juveniles may elect to migrate substantial distances through the nearshore marine environment from the natal river basin to adjacent areas.

In Puget Sound tidally influenced floodplain areas, subadult bull trout have been observed or captured in three restored and two natural tidal channels and larger distributary channels, including areas along the lower Snohomish River: two small tidal channels off Ebey Slough (M. Rowse, NMFS, unpublished data), Union Slough, in the spring of the first year after dike removal and restoration of Spencer Island (Tanner et al. 2002), and all three distributary channels of the Snohomish River – Union, Steamboat, and Ebey Sloughs in upstream and downstream migratory movements during spring, summer, and fall of 2002 (F. Goetz, USACE, unpublished data). As a federally threatened species, the occurrence and potential effects of the proposed dredging and disposal activities on bull trout are addressed in detail in Section 6.5, based largely on the multi-year acoustic telemetry study the Seattle District Corps has been conducting of sub-adult and adult bull trout use of nearshore marine waters from the Snohomish River to Padilla Bay.

Four chinook salmon stocks are present within the Snohomish River drainage: Snohomish summer chinook, Snohomish fall chinook, Bridal Veil Creek fall chinook, and Wallace River summer/fall chinook (WDFW SASI 1994). The spring-run chinook salmon population formerly present is now considered extinct (Nehlsen et al. 1991). The Snohomish summer- and fall-run populations, maintained by natural production, are classified as depressed (Priority Habitat and Species database search August 22, 2003, WDFW SASI 1994). Habitat degradation in the mainstem river due to agricultural diking and industrial pollution, in addition to a lack of large woody debris and gravel removal are believed to negatively affect production of the Snohomish River summer and fall stocks (WDFW SASI 1994). The Wallace River stock is considered to be a mixture of wild stocks and hatchery straying. The Wallace River stock is considered healthy and the Bridal Veil Creek stock status is unknown due to sparse survey data (WDFW SASI 1994).

Adult chinook return to the estuary and begin to reenter fresh water beginning in June and July and continuing through August and September. Out-migrating chinook salmon juveniles are present in the estuary from April through July. As a federally threatened species, the occurrence and potential effects of the proposed dredging and disposal activities on chinook salmon are addressed in detail in Section 6.6.

Birds

Bald eagles are occasionally seen flying over the Marine Sediment Unit and the PSSDA open water disposal site in Elliott Bay, as well as over the Port Gardner Bay PSSDA site. Bald eagles are commonly seen flying over Possession Sound and are frequently seen perching and foraging along the lower Snohomish River. Several bald eagle nests occur within three miles of the

downstream settling basin and Jetty Island and within four miles of the upstream settling basin and the Riverside Business Park site. As a federally threatened species, the occurrence and potential effects of the proposed dredging and disposal activities on bald eagles are addressed in detail in Section 6.2.

Similarly, the marbled murrelet is a permanent, though not common resident of southern Puget Sound in the vicinity of the open water disposal sites and the lower Snohomish River. In the Pacific Northwest, it forages almost exclusively in the nearshore marine environment (mainly within a few miles of shore), but nests in old growth forests as much as 50 miles from marine waters. Marbled murrelet nests do not occur within the action area, but murrelets may forage within the waters of Elliott Bay or Possession Sound, particularly during the winter. As a federally threatened species, the occurrence and potential effects of the proposed dredging and disposal activities on marbled murrelets are addressed in detail in Section 6.3.

The shorelines of and the waters overlying the Marine Sediment Unit provide habitat to a number of terrestrial and water dependent birds that may serve as prey for bald eagles. These species include loons, grebes, cormorants, scaups, mergansers, coots, and gulls. The majority of these birds utilize the water column habitat in the vicinity of the MSU during their respective over wintering periods. These over wintering waterfowl species are generally found in the central Puget Sound region from early November through late April, with the highest concentrations during December through February. The remaining waterfowl are present year-round. Most of the year-round and over wintering species are classified as “divers” and actively pursue pelagic and benthic organisms up to 30 feet or more below the water surface.

The Snohomish River estuary is recognized as regionally important during spring migrations of shorebirds and fall migrations of raptors and waterfowl. The abundant waterfowl, marine birds, and shorebirds within the lower Snohomish River provides an avian prey base for bald eagles peregrine falcons, merlins, and other raptors. Common species include ring-necked ducks, American wigeons, Canada geese, mallards, pintail, scoters, mergansers, and bufflehead. Other common species include double-crested cormorants, western grebes, American coots, brants, pigeon guillemots, and several gull species (Pentec 1992). During winter migrations, the flooded agricultural fields along the lower Snohomish River attract snow geese, trumpeter swans, snowy owls, merlins, great-horned owls, and gyrfalcons (Ken Brunner, USACE, personal communication). Shorebirds are commonly observed along the lower river in the tidal mudflats and marshes or along sandy shorelines. Common species include dunlins, western sandpipers, dowitchers, black-bellied plovers, and yellowlegs (City of Everett et al. 1997). Eighteen species of shorebirds have been observed and over 8,700 individuals were reported on April 27, 1995 using the habitats on the Jetty Island berm (Pentec 1996)

Several other bird species that inhabit the action area are either Federal Species of Concern or are listed by Washington State as Monitor, Candidate, or Sensitive species. The peregrine falcon (Federal Species of Concern and State Sensitive), osprey (State Monitor), great blue heron (State Monitor), and purple martin (State Candidate) all occur within the action area and have been observed either near the open water disposal sites or along the lower Snohomish River.

Since 1994, a pair of peregrine falcons has been nesting atop the east side of the Washington Mutual Tower, seven miles to the east of the MSU and the Elliott Bay PSSDA site in downtown

Seattle. While this pair has not been active at the Washington Mutual site in 2003, the female may be nesting about four blocks away at One Union Square and the male may be nesting with other females in West Seattle. Another pair of peregrine falcons is reported to be nesting on the SR 529/Highway 10 bridge over the Snohomish River, approximately 2 miles upstream of the downstream settling basin and 2 miles downstream of the upstream settling basin (Priority Habitat and Species database search August 22, 2003). Peregrine falcons would be expected to hunt waterfowl over the disposal sites in Possession Sound and Elliott Bay, and within the vicinity of the settling basins in Port Gardner Bay. Peregrine falcons would also be expected to hunt waterfowl and pigeons over the lower Snohomish River and associated shoreline industrial and marine facilities.

Osprey are frequently seen foraging for fish over Possession Sound, Port Gardner Bay, Elliott Bay and the lower Snohomish River and appear to be fairly tolerant of human disturbance when choosing nesting locations. Approximately 20 osprey nests have been documented within a mile of the downstream settling basin in Port Gardner Bay over the last decade (Priority Habitat and Species database search August 22, 2003), many of which were active in 2003.

Similarly, great blue herons are also frequently seen wading within the intertidal areas of the lower Snohomish River. Bald eagles are known to disrupt rookeries while attempting to prey upon young herons. There is an active heron rookery documented approximately 1.5 miles northeast of the upstream settling basin on Spencer Island. Other nesting activities documented within the area include a rookery northwest of the downstream settling basin at Priest Point and a nest at the south end of Lake Stevens (Priority Habitat and Species database search August 25, 2003).

In recent years, private individuals have erected purple martin nest boxes around Puget Sound and the lower Duwamish and Snohomish Rivers and these boxes have successfully attracted nesting purple martins. As of 2000, 40 nest boxes had been constructed at the Everett waterfront north of the 10th Street boat launch, just upstream of the downstream settling basin and have variously supported nesting purple martins (Priority Habitat and Species database search August 25, 2003).

The horned grebe and red-necked grebe (State Monitor species), as well as the western grebe, Brandt's cormorant, merlin, and common murre (all of which are State Candidate species) and the common loon (State Sensitive species) are also likely to forage over or utilize surface waters associated with the MSU in Elliott Bay.

Marine Mammals

Steller sea lions are known to migrate into Puget Sound and have been sporadically seen in inland water areas, including the San Juan Islands, rock outcroppings along the Strait of Juan de Fuca, near Everett, in Shilshole Bay, off the Ballard Locks, and occasionally in south Puget Sound. However, they are not considered common residents of the action area, with no breeding rookeries identified in Washington, and haul-out areas generally confined to the Columbia River, the western and northern coasts of the Olympic Peninsula, and the coast of Vancouver Island and the Gulf Islands in British Columbia. As a federally threatened species, the occurrence and

potential effects of the proposed dredging and disposal activities on Steller sea lions are addressed in detail in Section 6.4.

Harbor seals and Dall's porpoise are known to frequently forage in Elliott Bay and are both State Monitor Species (Calambokidas 1991). Juvenile California gray whales (State Sensitive Species) occasionally stray into Puget Sound and forage in the mud and sandflats of the Snohomish estuary. Harbor seals are also common within the lower Snohomish River where they forage for fish. Similarly, orca whales and Pacific harbor porpoise are also common within Elliott Bay and Possession Sound and are both State Candidate Species (Calambokidas 1991). Pacific harbor porpoise and California sea lions are also common inhabitants of the action area. Pacific harbor porpoise and harbor seals are year-round residents. California sea lions frequent the log boom adjacent to the Navy pier at the Everett Naval Station and may also utilize waters of Elliott Bay in the winter to feed on migrating salmon and steelhead trout (Pfeifer 1991). Both harbor seals and California sea lions have been seen hauled out on floats and navigation buoys moored within the Marine Sediment Unit and have documented haulout areas just off of Everett in Possession Sound.

4.2.3.2 Benthic and Epibenthic Prey Availability

Benthic and epibenthic invertebrate prey assemblages associated with the intertidal habitats created in and around Jetty Island have been documented by Pentec as part of their post-construction monitoring of the island. Their studies have documented rapid colonization and high epibenthic zooplankton productivity in the mudflats within the protected embayment formed by the berm.(Pentec 1996). Since 1990, qualitative excavations have shown a continual increase in the apparent density and diversity of the infaunal community, including polychaetes, crustaceans, and mollusks. The density and diversity of invertebrate assemblages within and around Jetty Island, as well as within the larger Snohomish River estuary is also evidenced by the migratory and year-round use of the area by foraging shorebirds (as described in Section 4.2.3.1)

While the intertidal habitats of Jetty Island have been studied and documented over the past five years, benthic assemblages within the deeper and unvegetated portions of the settling basins and dredged portions of the navigation channel are not well documented, although are expected to be of much lower biodiversity than those of the adjacent intertidal marshes and mudflats due to their depth and regular accumulation of fine sediments. Because of their occurrence at deeper depths, the assemblages within the center of the basins and navigation channel are also likely of lower functional value to juvenile salmonids.

EPA has demonstrated that important benthic and epibenthic prey assemblages exist within the PSR Superfund site and the Marine Sediment Unit, including species researchers have considered sensitive to pollution. However, sample areas that were associated with known contaminated sediments showed a distinctly different benthic community. The dominant species at the contaminated locations are all polychaete worms that are frequently associated with stressed habitats. EPA concluded that the presence of contaminated sediment in unremediated areas adversely affects the species diversity and abundance of benthic organisms and therefore affected the diversity and abundance of the prey resources available to migrating salmonids.

4.2.3.3 Forage Fish Availability

Forage fish larvae are ubiquitous in Puget Sound and are a common component of the nearshore plankton. As such, it is difficult to determine the source of this prey item within any given estuary. Very little research has been done to determine if larvae using any given estuary originate in nearby spawning grounds. Intertidal spawning habitat was historically more abundant, however, armoring and other shoreline modifications have limited the amount of available spawning areas.

Forage fish include Pacific herring, surf smelt, and sand lance larvae and juveniles prey on epibenthic invertebrates and crustaceans and are themselves important prey items for larger juvenile salmon and bull trout. Sand lance is particularly important for juvenile chinook and bull trout. Both juvenile surf smelt and sand lance have been captured by Pentec during seining within the lagoon formed by the berm on Jetty Island (Pentec 1996) and are abundant in the shallow waters of the Snohomish River estuary and the nearshore marine waters of Possession Sound and Port Gardner Bay. None of these forage fish species spawn at the open water disposal sites or within the lower Snohomish River due to the modified shoreline and lack of intertidal gravel and sandy beaches (WDFW PHS database search, August 22, 2003).

Within the action area, surf smelt spawning occurs on to the south of the Everett Naval Station along the Mukilteo shoreline, along the southern shore of Whidbey Island and Port Susan, and along the southeastern shore of Whidbey Island (WDFW PHS database search August 22, 2003, D. Pentilla Washington State Surf Smelt Fact Sheet undated). Documented Pacific sand lance spawning beaches occur in these same areas, as well as use of the Gedney Island shoreline (WDFW PHS database search August 22, 2003, D. Pentilla, Washington State Sand Lance Fact Sheet, undated). Pacific herring spawn within along the shoreline northwest of the Tulalip Indian Reservation and along the eastern shore of Camano Island (WDFW PHS database search August 22, 2003, D. Pentilla Washington State Pacific Herring Fact Sheet undated).

4.2.3.4 Intertidal Vegetation

Intertidal marshes along the lower Snohomish River are dominated by typical native estuarine emergent species including: Lyngby's sedge (*Carex lyngbyei*), pickleweed (*Salicornia virginica*), fleshy jaumea (*Jaumea carnosa*), tufted hairgrass (*Deschampsia caespitosa*), hard-stem bulrush (*Scirpus acutus*), and Pacific silverweed (*Potentilla pacifica*) with generally forested and scrub-shrub wetland and upland buffers. Portions of the formerly diked Spencer Island have been breached to restore tidal connectivity and intertidal vegetation to the island which is just upstream of the upstream settling basin at the confluence of Union and Steamboat Sloughs with the mainstem of the Snohomish River.

4.2.3.5 Riparian Vegetation

Riparian forests and areas of palustrine scrub-shrub wetland fringe portions of the lower river and it's sloughs. These areas are dominated by Sitka spruce (*Picea sitchensis*), Pacific willow (*Salix lucida*), Scouler's willow (*Salix scouleriana*), western red cedar (*Thuja plicata*) and black

cottonwood (*Populus balsamifera*) trees with an understory of salmonberry (*Rubus spectabilis*), red elderberry (*Sambucus racemosa*), red-osier dogwood (*Cornus sericea*), Nootka rose (*Rosa nutkana*), Douglas spirea (*Spirea douglasii*), and western crabapple (*Malus fusca*). Common invasive species include reed canarygrass (*Phalaris arundinacea*), Himalayan blackberry (*Rubus discolor*), and evergreen blackberry (*Rubus laciniatus*).

5.0 EFFECTS OF THE ACTION

The effects of disposal of the dredged material at either of the PSSDA open water disposal sites or beneficial use of the dredged material for capping the Marine Sediment Unit of the PSR-Superfund site have been analyzed in detail in previous BA's (USACE and EPA 2002, USACE 2000a, USACE 2000b). Both USFWS and NOAA Fisheries have concurred with the effects determinations presented in those documents for potential effects from proposed disposal activities at both the PSDDA and the MSU sites (PSSDA site -USFWS 2000, NMFS 2000, NMFS 2003b; MSU site –USFWS 2003, NMFS 2003a).

Consequently, this analysis focuses primarily on the short- and long-term, direct and indirect effects of routine maintenance dredging of the lower and upstream settling basins and adjacent portions of the navigation channel on Federally listed endangered or threatened species under the jurisdiction of USFWS and NOAA Fisheries. The proposed dredging will occur during Fiscal Years 2004 through 2008, between October 16 and February 14 of each year. Potential effects from disposal of the dredged material are addressed by reference to the above documents for the PSR Superfund site and the PSSDA open water disposal sites.

Effect determinations were based on predicting changes from the baseline condition of the indicator-based categories of habitat function described in Section 3.0. This evaluation is generally qualitative in nature and is divided into effects on the water quality, physical habitat quality, and biologic habitat quality pathways (Sections 5.1, 5.2, and 5.3), followed by a synopsis of potential interrelated, interdependent, and cumulative effects. Specific effect determinations for bald eagle, marbled murrelet, Steller sea lion, bull trout, and Puget Sound chinook salmon (Section 6.0) conclude this document.

5.1 Effects on Water Quality

5.1.1 Water contamination

The Washington Department of Ecology (WDOE) regulates water quality through a project specific Water Quality Certification and short-term Modification to the Water Quality Standards authorizations, if necessary to accommodate 'essential' activities. The most recent Water Quality Certification and Modifications (WDOE certification CENPS-OP-TS-NS-99, effective through July 30, 2002) specifies the following criteria to accommodate temporary impacts on water quality: a mixing zone of 300 feet radially from the approximate center of active dredging, waived Class A turbidity standards, and no reduction in dissolved oxygen below 6.5 mg/l. The WDOE Water Quality Certification also stipulates that clamshell dredging be conducted in a

manner that minimizes the amount of water retained in the bucket, including holding the bucket just above the surface of the water for a brief period to allow excess water to escape and a series of corrective measures to be taken if water quality parameters exceed established standards during dredging operations. These corrective measures emphasize the following: (1) modifying the dredging activity or equipment; (2) reducing the dredging rate; or (3) stopping dredging operations. These corrective measures would apply until dredging operations demonstrated compliance with water quality standards.

As part of the permitting process associated with the FY 2004 through 2008 dredging and disposal proposal, the Corps will prepare a request for a new WDOE Water Quality Certification, as well as a Modification to the Water Quality Standards. Similar criteria, conditions, and corrective measures are expected to be part of Water Quality Certification package. Compliance with WDOE Water Quality Certification standards and the accompanying conditions is expected to minimize water quality impacts, including contamination of the water column, during dredging to levels that will not degrade water quality conditions within the action area.

While the project is expected to result in short-term suspension of sediments in the area immediately adjacent to the dredging equipment, the sediments of the settling basins and adjacent portions of the navigation channel are considered 'low ranked' for contaminates. When sediments from the proposed dredging areas were previously tested in September 1996 in accordance with the Dredged Material Management Office's PSSDA protocols, the Dredged Material Management Plan Agencies concluded that all the material was suitable for placement at the Port Gardner Bay PSSDA open water disposal site. The Interagency Dredged Material Management Office will sample sediments from within the proposed downstream dredging areas according to the PSSDA protocols the week of September 22, 2003; these samples will subsequently be tested to determine whether the sediment continues to meet the standards for disposal at the PSSDA site, as well as the Washington State Department of Ecology's Sediment Management Standards (SMS) and Atterberg Limits for use as capping material at the PSR Superfund site (see Section 3.2.2).

If samples from any individual dredge area were found unsuitable for unconfined open water disposal at the PSSDA site, the sediment from within that dredging area would not be dredged under this proposed action. The future disposal of any such sediment would be addressed as a separate action and a separate BA would be prepared.

No contamination of the water column as a result of the dredging or subsequent disposal at the PSSDA open water disposal site in Port Gardner Bay or beneficial use for capping at the PSR Superfund site is thus expected. Disposal activities will be conducted in accordance with established criteria for either the PSR Superfund or the PSSDA sites. Effects of the disposal actions are analyzed in detail within the Biological Assessment previously prepared by the Corps (PSSDA site -USFWS 2000, NMFS 2000, NMFS 2003b; MSU site –USFWS 2003, NMFS 2003a).

Therefore, temporary impacts to water quality during dredging are expected to be insignificant and discountable and are not expected to significantly degrade the existing water quality condition through water contamination within the action area or have adverse effects on listed species (as detailed in Section 6.0).

5.1.2 Turbidity

Temporary increases in turbidity (as measured by suspended sediment concentration) are expected in the dredging and disposal areas. During dredging, suspended sediment concentrations vary throughout the water column, with larger sediment plumes typically occurring at the bottom closer to the contact point of the clamshell dredge. Concentrations typically then decrease exponentially moving away from the dredging site both vertically and horizontally. LaSalle reported an affected plume area of 300 meters at the surface and 450 meters at the bottom for bucket dredging in San Francisco Bay (LaSalle 1990). LaSalle also reports that suspended sediment concentrations in surface and bottom waters can be highest for bucket dredges (compared to hydraulic cutterhead, hopper, and agitation dredging) due to: 1) sediment suspension from the bucket's impact on the bottom and the withdrawal of the bucket from the bottom, 2) material washing from the top and sides of the bucket as it passes through the water column, 3) spillage as the bucket breaks the water's surface, 4) spillage of material during barge loading, or 5) intentional overflow in an attempt to increase the barge's effective load (LaSalle 1990).

These increases in turbidity could affect juvenile salmonids occurring in the immediate dredging area through decreased visibility for behaviors such as feeding and homing, territoriality, and avoidance responses, as well as direct impairment of oxygen exchange due to clogged or lacerated gills. Duration, timing, and particle size and shape have been shown to influence the potential affect of increased turbidity on Pacific salmon juveniles, but there is little specific information on thresholds of physical, physiological, or behavioral tolerances for particular species. It is unknown what threshold of turbidity might exist that serves as a cue to fish to avoid light reducing turbidity. The primary determinate of risk level for a particular species is likely to lie in the spatial and temporal overlap between the area of elevated turbidity, the degree of turbidity elevation, the occurrence of the fish, and the options available to the fish for carrying out the critical function of their particular life-history stage (Nightingale and Simenstad 2001).

The available evidence indicates that total suspended solids (TSS) levels sufficient to cause such effects would be limited in extent during dredging. LeGore and Des Voigne (1973) conducted 96-hour bioassays on juvenile coho salmon using re-suspended Duwamish River sediments. Acute effects were not observed at suspended sediment concentrations up to 5 percent (28,800 mg/l dry weight), well above levels expected to be suspended during dredging. Salo et al. (1979) reported a maximum of only 94 mg/l of sediment in solution in the immediate vicinity of a working dredge in Hood Canal. Palermo et al. (1986) reported that up to 1.2 percent of sediments dredged by clamshell became suspended in the water column.

The proposed dredging period also coincides with periods of naturally higher background turbidity due to high winter levels of precipitation and runoff. Average suspended sediment levels recorded during the window of the proposed dredging (October 1 through February 14) have been 7.4 NTU (from October 1976 and January 2002), including the highest readings of 51 NTU during the high flows of October 17, 1988, 31 NTU on November 28, 1977, and 27 NTU recorded on December 13, 1982. The Snohomish River is also characterized by sporadically higher levels of suspended sediment occurring just after the end of the proposed dredging

window (post February 14). Maximum suspended sediment levels recorded since 1976 include 100 NTU recorded on February 16, 1982, 90 NTU on February 20, 1995, and 86 NTU recorded on February 17, 1981. It should be noted that these turbidity levels were recorded at the monitoring station upstream of the proposed dredging areas (at the town of Snohomish); the mixed waters of the estuary would naturally have higher turbidity levels, particularly during the period of the proposed dredging.

During the dredging, areas of increased turbidity over background levels are expected to last only for a short duration. Any early migrating juvenile salmonids or adults that may be transiting through the downstream settling basins could hold in the adjacent intertidal areas along the eastern shoreline of Jetty Island until any areas of increased turbidity dissipates into background levels. Similarly, early migrating juvenile or adults transiting through the upstream settling basin could hold along the shoreline or up into Union or Steamboat sloughs until the temporary turbidity dissipates.

The above information indicates that turbidity (suspended solids) would be elevated on a temporary and localized basis by dredging, but that total suspended sediment levels sufficient to cause adverse effects on the species of concern would be very limited in extent and duration. However, in order to further reduce potential negative effects of turbidity on juvenile salmonids, even of limited duration, dredging operations would be timed between October 16 and February 14 specifically to avoid juvenile out-migration periods. This timing will dramatically reduce the temporal overlap between anticipated increases in turbidity during dredging and the presence of juvenile salmonids within the lower Snohomish River, thereby reducing the potential for exposure of juveniles to harmful levels of turbidity to a negligible level.

Therefore, temporary increases in turbidity during dredging are expected to be insignificant and discountable and are not expected to result in long-term degradation of the existing water quality condition within the action area or to have adverse effects on listed species (as detailed in Section 6.0).

5.1.3 Dissolved Oxygen

Dissolved oxygen (DO) concentrations tend to decline in the vicinity of dredging and disposal operations when the suspension of anoxic sediments creates high chemical oxygen demand. Temporary decreases in DO associated with increased suspended sediments are possible in the immediate dredging plume area. Short-term, temporary effects on fish as a result of decreases in DO include avoidance of the dredging area and reduced foraging during and immediately after dredging as fish avoid areas of temporarily depressed dissolved oxygen. Recently updated WDOE Water Quality Standards dictate that minimum dissolved oxygen concentrations not fall below 8.0 mg/L for waters designated as non-core areas for salmon and trout rearing and migration (such as the lower Snohomish River) (Chapter 173-201A, WDOE 2003) without a Modification to Water Quality Standards issued by WDOE. Within the time period of the proposed dredging, minimum dissolved oxygen levels were 9.6 mg/L recorded on October 19, 1987, in conjunction with the minimum record flow in the river (850 cfs).

Adult fish are expected to avoid any localized areas of significantly depressed dissolved oxygen and utilize the adjacent, non-dredged intertidal areas for refuge during operation of the dredge. Juvenile salmonids will not be exposed to reduced dissolved oxygen conditions due to the timing of dredging between October 16 and February 14, outside of their migratory window. Potential impacts due to reductions in dissolved oxygen levels as a result of dredging/disposal operations are thus expected to be highly localized and temporary.

Therefore, temporary decreases in dissolved oxygen during dredging are expected to be insignificant and discountable and are not expected to result in long-term degradation of the existing water quality condition within the action area or to have adverse effects on listed species (as detailed in Section 6.0).

5.1.4 Temperature

The proposed maintenance dredging is not expected to significantly alter the depth or extent of the salt wedge within the lower Snohomish River. The resulting configuration of the bottom will not significantly change currents or flow pathways within the navigation channel from their historic condition since the authorization of maintenance dredging in 1910 of the navigation channel. Dredging will remove areas of shoaled sediments and will return the settling basins and portions of the navigation channel to their authorized depths. The dredging will similarly have no effect on the distribution or density of riparian vegetation fringing (and shading) the river.

Therefore, the proposed dredging is not expected to result in a change to water temperature in the action area or to affect listed species that may be sensitive to changes in water temperature (as detailed in Section 6.0).

5.2 Effects on Physical Habitat Quality

5.2.1 Sediment Contamination

The regular testing of sediments within the proposed dredging area ensures that any contaminated sediments are identified prior to dredging. This testing thus minimizes the potential resuspension or transport of contaminated sediments to other areas by preventing contaminated sediments from being disturbed during dredging. Sediments from the proposed dredging areas are considered to be 'low ranked' for contaminates and have been consistently suitable for both beneficial uses and open water disposal since the most recent sediment characterization in 1996.

The Corps Dredged Material Management Office will again sample sediments from within the proposed dredging areas according to the PSSDA protocols the week of September 22, 2003; these samples will subsequently be tested to determine whether the sediment continues to meet the standards for disposal at the PSSDA site, as well as the Washington State Department of

Ecology's Sediment Management Standards (SMS) and Atterberg Limits for use as capping material at the PSR Superfund site (see Section 3.2.2).

If samples from any individual dredge area were found unsuitable for unconfined open water disposal at the PSSDA site, the sediment from within that dredging area would not be dredged under this proposed action. The future disposal of any such sediment would be addressed as a separate action and a separate BA would be prepared.

Therefore, the proposed dredging is not expected to change the degree, nature, or distribution of sediment contamination within the action area or to have an adverse effect on listed species (as detailed in Section 6.0). If the dredged material is used for capping the Marine Sediment Unit of the PSR Superfund site, the proposed project could in fact reduce the exposure and uptake of sediment contaminates from that area.

5.2.2 Shoreline and Estuarine Habitat Conditions

Maintenance dredging will not result in any deepening and/or widening of the navigation channel or the settling basins; dredging will only be conducted to maintain the authorized depths (plus up to 2 feet over-depth) of the navigation channel (-8 feet) and the settling basins (lower basin –15 to –20 feet, upper basin –30 feet). The dredging is unlikely to degrade the migratory pathway or foraging habitat of juvenile salmonids because they generally follow shoreline habitats and would not be expected to utilize the 150-foot wide center of the navigation channel (where the dredging is concentrated), and would also not be expected to be in the dredging area during the window of October 16 to February 14. The dredging would not impact intertidal mudflats or areas of saltmarsh.

Therefore, the proposed dredging is not expected to degrade the character or distribution of shoreline or estuarine habitat or to negatively affect the ability of listed species to utilize those habitats (as detailed in Section 6.0).

5.2.3 Disturbance/Noise

Maintenance dredging within the lower Snohomish River will temporarily increase ambient noise levels as the dredge is working. Lights operating on the dredge will temporarily increase ambient lighting levels at night in the immediate vicinity of the dredge, but are not expected to adversely affect neighboring properties or adjacent habitats due to the short duration of their presence. Noise and activity during dredging operations could temporally flush some species from the adjacent shoreline areas and from the immediate area of the working dredge, but this effect is expected to be temporary. Once the dredge ceases to operate, there will be no long-term effects from the temporary increase in noise.

Therefore, temporary increases in noise and disturbance during dredging are expected to be insignificant and discountable and are not expected to significantly degrade existing conditions within the action area or to have adverse effects on listed species (as detailed in Section 6.0).

5.3 Effects on Biologic Habitat Quality

5.3.1 Biological Resources

5.3.1.1 Fish

A clamshell dredge would be used for the proposed project. Due to the characteristics of this equipment, it is generally accepted that clamshell buckets do not have the potential to entrain fish because the bucket cannot trap or contain a mobile organism during its descent because it is totally open. Due to this understanding of the operation of the clamshell, no specific studies of entrainment of fish have been conducted on this type of equipment. In contrast, due to the recognized potential for hydraulic dredges to entrain fish, the hydraulic dredge has been studied extensively. Typically, hydraulic dredges have been found to entrain few or no salmonids or other mobile fishes (McGraw and Armstrong 1988, Larson and Moehl 1988, Larson and Cassidy 1990, Kyte and Houghton 1994, Reine et al. 1998). Based on the operation of the clamshell dredge bucket, and the ability of salmonids to avoid entrainment in hydraulic dredges, the proposed dredging using an open clamshell bucket is not likely to entrain juvenile, sub-adult, or adult salmonids.

The temporary increases in noise, turbidity, and water column disturbance during the dredging is expected to signal adult fish to avoid the area during dredging activities. Because intertidal areas are located outside the edges of the dredging areas and because the dredging is generally centered within the navigation channel and settling basins, adults can readily avoid the disturbed portion of the water column by moving toward the shoreline and either holding or transiting around the area being dredged. The proposed dredging is not likely to adversely affect adult salmonids if their upstream migration overlaps the dredging period. Due to the timing of the dredging, few juvenile salmonids are expected to migrating through the waterway or using the adjacent shoreline habitats. If any early migrants are moving through the area during the period of dredging, they are likely to remain near the shoreline, thereby avoiding the disturbances associated with dredging in the main navigation channel.

Therefore, although there will be temporary increases in noise and disturbance, coupled with temporary decreases in water quality surrounding the dredging, these are expected to be insignificant and discountable effects on local fish populations in the action area and are not expected have adverse effects on listed fish species (as detailed in Section 6.0).

5.3.1.2 Birds

Resident populations of bald eagle, osprey, peregrine falcon, great blue heron, purple martin, and the variety of songbirds, shorebirds, and waterfowl that utilize the lower Snohomish River are believed to be acclimated to the levels of human disturbance, noise, and the existing, degraded habitats within the highly urbanized area surrounding the downstream settling basin and navigation channel. Resident individuals wintering along the shore or within areas of saltmarsh may avoid the center of the navigation channel during dredging, but this effect is expected to be temporary. Resident waterfowl and seabirds resting or foraging in Port Gardner Bay and Elliott Bay are also expected to avoid the immediate area of the disposal activities while the barges are

being dumped over the PSSDA site or the PSR Superfund site. Resident birds are expected to immediately return to their usual foraging areas and behaviors after the dredging stops and thus the proposed action is not expected to reduce the foraging prey base for bald eagles (see Section 5.3.3). Seagulls and other more aggressive birds that regularly utilize the lower Snohomish River, such as crows and possibly osprey, may be attracted to the dredging area by any temporarily disoriented fish that are avoiding the water column surrounding the dredge.

The proposed dredging is thus expected to have insignificant and discountable effects on resident birds in the action area and is not expected have adverse effects on listed bird species (as detailed in Section 6.0).

5.3.2 Benthic and Epibenthic Prey Availability

Dredging will temporarily reduce the populations of the benthic and epibenthic invertebrate community through removal of the benthic substrate and smothering as suspended sediments settle out of the water column. Invertebrate prey for juvenile salmonids and bottom fish will thus be temporarily reduced within the navigation channel and the settling basins. Total organic carbon could be slightly lower in the newly exposed sediments after dredging. Thus, the amount of food (in the form of organic matter) available for benthic invertebrates immediately adjacent to the edges of the dredged channel and basins would be slightly reduced on a temporary basis.

While benthic and epibenthic prey species will be temporarily displaced, populations are expected to recover shortly (within one year) after dredging activities are completed. Adjacent undisturbed intertidal habitat along the channel edges will continue to provide an established source of benthic and epibenthic invertebrates to colonize the newly disturbed subtidal substrate. Since new invertebrate communities will recolonize the dredging area, no long-term loss of biological productivity or prey base for juvenile salmonids or bottom fish is expected.

Disposal of the dredged sediments will also eliminate deeper subtidal invertebrate communities at the disposal sites by smothering them. However, as with shallower benthic and epibenthic invertebrates within the channel and basins, recolonization from adjacent areas is expected within a relatively short timeframe (two to three years). Romberg et al. (1995), studying a subtidal sand cap placed to isolate contaminated sediments in Elliott Bay, identified 139 species of invertebrates five months after placement of the cap. The benthic community reached its peak population and biomass approximately two and one-half years after placement of the cap, and then decreased, while the number of species increased to 200 as long-lived species recruited to the population (Wilson and Romberg 1996).

If the dredged sediments are used to cap the contaminated sediments of the Marine Sediment Unit at the PSR Superfund site, the benthic invertebrate community in that area is expected to ultimately be restored through creation of cleaner benthic habitat. Thus, higher invertebrate diversity and abundance are expected in this area once exposure to contaminated sediments is reduced or eliminated through capping.

Therefore, although there will be temporary decreases in benthic and epibenthic prey within the dredged area, this decrease is expected to cause an insignificant and discountable effect on local

fish populations in the action area and are not expected have adverse effects on listed fish species through food web interactions (as detailed in Section 6.0).

5.3.3 Forage Fish Availability

Temporary effects on the forage fish community are possible during dredging and disposal activities. Forage fish such as Pacific herring and surf smelt are expected to avoid the dredging area, resulting in a temporary loss of forage fish from the immediate area during the dredging period. Sandlance could be entrained in the clamshell bucket during daytime dredging, but they are unlikely to be affected by dredge 'bites' that occur at night since these fish diurnally burrow into beaches at night.

Dredging and disposal activities are not expected to effect the spawning of Pacific herring, surf smelt, or sand lance because there is no appropriate spawning habitat within the immediate vicinity of the dredging or disposal activities. Forage fish are expected to immediately return to their usual foraging areas and behaviors after the dredging and disposal activities stop.

Therefore, although there will be temporary disturbance to forage fish populations, coupled with temporary decreases in water quality surrounding the dredging, these are expected to be insignificant and discountable effects on local forage fish populations in the action area and these effects are not expected have adverse effects on listed fish species through foodweb interactions (as detailed in Section 6.0).

5.3.4 Intertidal Vegetation

Because dredging activities are concentrated in the center of the navigation channel and settling basins that support only subtidal habitats, the proposed dredging will not directly impact any intertidal marsh areas within the lower Snohomish River. By maintaining the navigatable depth of the waterway, the proposed dredging will help prevent vessels from stranding on existing intertidal marshes along the navigation channel. Vessel stranding and salvage has the potential to cause catastrophic disturbance to salt marshes.

The proposed dredging is thus not expected to degrade the character or distribution of intertidal vegetation, or to negatively affect the ability of listed species to utilize intertidal marshes in the vicinity of the proposed dredging (as detailed in Section 6.0).

5.3.5 Riparian Vegetation

Because dredging activities are concentrated in the center of the navigation channel and settling basins that support only subtidal habitats, the proposed dredging will not impact the riparian trees and shrubs which fringe portions of the lower Snohomish River. The proposed dredging is thus not expected to degrade the character or distribution of riparian vegetation, or to negatively affect the ability of listed species to benefit from the areas of riparian vegetation within the action area.

5.4 Cumulative, Interrelated, and Interdependent Effects

The disposal of the dredged material generated by the dredging operations is an interrelated and interdependent effect of the proposed dredging. The effects of disposal of the dredged material at either the PSSDA open water disposal site or beneficial use of the dredged material for capping the Marine Sediment Unit of the PSR-Superfund site have been analyzed in detail in previous BA's (USACE and EPA 2002, USACE 2000a, USACE 2000b). Both USFWS and NOAA Fisheries have concurred with the effects determinations presented in those documents for potential effects from proposed disposal activities at both the PSDDA and the MSU sites (PSSDA site -USFWS 2000, NMFS 2000, NMFS 2003b; MSU site –USFWS 2003, NMFS 2003a).

Other interrelated and interdependent effects of the proposed dredging include the continuation of commercial and recreational vessels utilizing the lower Snohomish River via the navigation channel. The proposed dredging safeguards navigation within the River by removing potentially hazardous areas of shoaling and maintaining the authorized depth of the navigation channel. The proposed dredging also removes shoaled sediments that would otherwise hinder safe navigation within the Everett Marina and at adjacent industrial, commercial, and recreational piers. These effects are not expected to increase due to the proposed dredging; rather they are a continuation of the current type and intensity of use in the lower Snohomish River.

Other projects with the greatest potential to have cumulative effects with the proposed maintenance dredging are other periodic maintenance dredging and disposal of the boat basin by the Port of Everett. This type of project is similar in frequency to the proposed dredging, occurring every few years or longer, but is generally smaller in scope, usually in specific small areas that have shoaled in since the last dredging. The cumulative effects of such maintenance dredging projects on the physical parameters of the lower Snohomish River are expected to be similar to those of those effects described above, if clamshell dredging is utilized. These cumulative effects are expected to be temporary, insignificant, and discountable. Similarly, the cumulative effects of such maintenance dredging projects on bull trout, Puget Sound chinook salmon, Steller sea lions, bald eagles, and marbled murrelets are also expected to be minimal.

Minimal effects are expected because all of these projects would likely occur outside the fish window of October 16 to February 14 (or as otherwise defined by NOAA Fisheries, USFWS, or WDFW), and so would largely avoid effects on juvenile salmonids. Cumulative effects would also be minimized on bald eagles, marbled murrelets, and Steller sea lions by avoiding disturbance in and around local nests or haul out areas and by avoiding disruptions of the local prey base through appropriate timing of work windows. Therefore, there is very little potential for cumulative effects on bull trout, Puget Sound chinook salmon, bald eagles, marbled murrelets, Steller sea lions as a result of these multiple maintenance-dredging projects.

6.0 EFFECT DETERMINATIONS

6.1 Summary of Effect Determinations

Common Name	*Scientific Name*	*Effect on Listed Species*	*Effect on Designated Critical Habitat*
Bald Eagle	*Haliaeetus leucocephalus*	May affect, but is **not likely to adversely affect**	No critical habitat is designated
Marbled Murrelet	*Brachyramphus marmoratus*	May affect, but is **not likely to adversely affect**	**No effect** on designated critical habitat
Steller Sea Lion	*Eumetopias jubatus*	May affect, but is **not likely to adversely affect**	No critical habitat is designated
Puget Sound/Coastal Bull Trout	*Salvelinus confluentus*	May affect, but is **not likely to adversely affect**	No critical habitat is designated
Puget Sound Chinook Salmon	*Oncorhynchus tshawytscha*	May affect, but is **not likely to adversely affect**	May affect, but is **not likely to adversely affect**

6.2 Bald Eagle

The bald eagle was initially listed as endangered under the Endangered Species Act in 1978 throughout the lower 48 states, except in Minnesota, Michigan, Wisconsin, Washington, and Oregon, where it was listed as threatened. In 1995, the U.S. Fish and Wildlife Service reclassified the bald eagle from endangered to threatened throughout the lower 48 states due to the steady increase in their populations. On July 6, 1999, the U.S. Fish and Wildlife Service announced a proposal to delist the bald eagle under the Endangered Species Act in 1978. However, formal delisting of the species has not yet occurred.

6.2.1 Description of Species

The bald eagle is found along the shores of saltwater and freshwater lakes and rivers. In Washington, breeding territories are located in predominantly coniferous, uneven-aged stands

with old-growth components. Territory size and configuration are influenced by a variety of habitat characteristics, including availability and location of perch trees for foraging, quality of foraging habitat and distance of nests from waters supporting adequate food supplies. Habitat models for nesting bald eagles in Maine show that the eagles select areas with (1) suitable forest structure, (2) low human disturbance, and (3) highly diverse or accessible prey (Steenof 1978).

Although bald eagles may range over great distances, they usually return to nest within 100 miles of where they were raised. They typically mate for life. Their nest tree is usually the dominant tree in the canopy and they are often built within a mile of the water body used for foraging. Bald eagles typically build nests in mature old-growth trees, which are generally used in successive years. In Washington, courtship and nest-building activities generally begin in January and February. Egg laying begins in March or early April, with eaglets hatching in mid-April or early May. Eaglets usually fledge in mid-July and often remain in the vicinity of the nest for another month (Steenof 1978).

Bald eagles are adaptable, feeding on whatever is most expedient. Eagles often depend on dead or weakened prey, and their diet may vary locally and seasonally. Various carrion, including spawned salmon taken from gravel bars along wide, braided river stretches, serve as important food items during fall and winter. Waterfowl often are taken as well. Anadromous and warm-water fishes, small mammals, carrion, and seabirds are consumed during the breeding season (Steenof 1978). In winter, northern birds migrate south and gather in large numbers near open water areas where fish or other prey are plentiful.

6.2.2 Occurrence in Project Area

Nesting and wintering populations in almost all recovery areas in Washington, including the West Cascade Mountains recovery zone, have reached levels that may allow de-listing. In the state of Washington just over 100 nesting pairs of eagles were documented in 1978. Since that time, the nesting population has increased to approximately 600 pairs (WDFW 1999). Several hundred additional bald eagles occupy rivers and streams associated with the Skagit River system each winter between approximately October 31 and March 31 to feed on carcasses of salmon that have returned to spawn. Wintering populations in Washington are thought to be stable or increasing. However, habitat loss, degradation, and major disturbance factors continue to be serious problems that must be guarded against to assure population gains are not diminished.

Adult, sub-adult, and juvenile bald eagles are commonly sighted flying over or perched within the action area and are known to forage within and around Port Gardner Bay, Possession Sound, and the lower Snohomish River where they are year-round residents. They are also commonly seen flying over and occasionally foraging over Elliott Bay and the PSR Superfund site. Due to the industrialized nature of the lower Snohomish River and the lack of significant trees for nesting, there are no documented nests within the immediate vicinity of the proposed dredging. Similarly, wintering bald eagles do not generally concentrate along the lower Snohomish River Port Gardner Bay, Possession Sound, or Elliott Bay.

The nearest bald eagle nests to the dredging operations are all located at least two miles from either settling basin; recent bald eagle nesting has been documented west of the mouth of the main channel near Tulalip Bay and Priest Point and to the east of the main channel on Otter Island. Active nesting was recorded in 2001 along the shoreline of Tulalip Bay, approximately 3.3 miles northwest of the downstream settling basin and approximately 5 miles northwest of the upstream settling basin. Nesting at Priest Point, approximately 2.75 miles northwest of the downstream settling basin and 4.5 miles northwest of the upstream settling basin was also recorded in 2001 (WDFW PHS database search August 20, 2003). Nesting was also recorded in 2001 on Otter Island, located between Steamboat and Ebey Sloughs, approximately 4.2 miles east-northeast of the downstream settling basin and 2.9 miles northeast of the upstream settling basin. The riparian edges of Ebey Slough supported a bald eagle nest located approximately 5.5 miles southeast of the downstream settling basin and approximately 2.9 miles southeast of the upstream settling basin in 2001 (WDFW PHS database search August 20, 2003). Other local bald eagle nests include locations approximately 4 miles west of the downstream settling basin on Gedney Island and at the mouth of Pigeon Creek, approximately 2.2 miles south of the downstream settling basin. The Pigeon Creek nest was confirmed as active in the spring of 2003 (WDFW PHS database search August 20, 2003).

Both the Pigeon Creek and Gedney Island nests are located approximately two miles northwest and southeast, respectively, of the Port Gardner PSSDA open water disposal site. Both of these nests are well-established territories with yearly nesting activity (WDFW PHS database search August 20, 2003). The nearest bald eagle nest to the potential disposal operations in Elliott Bay is located at Duwamish Head, approximately one mile southwest of the Marine Sediment Unit (WDFW PHS database search June 5, 2003). This nest is frequently referred to as the “Salty’s” nest due to its proximity to the Salty’s at Alkai Restaurant and is also a well-established territory with yearly nesting activity.

6.2.3 Analysis of Effects

Potential effects of the proposed maintenance dredging on bald eagles include disturbance from the dredging and disposal activities and increased turbidity around navigation channel and the settling basins during dredging that may inhibit foraging or result in temporarily reduced food availability. Noise (running heavy equipment) and temporary increases in turbidity during dredging and disposal will likely cause prey fish and waterfowl to avoid the immediate area of the dredging and disposal operations. Consequently, resident or wintering bald eagles are expected to temporarily avoid the immediate area and forage elsewhere until dredging operations are completed.

Because the action area represents a small portion of the foraging habitat locally available for bald eagles along the shoreline of central Puget Sound, any such interference with bald eagle foraging activity is expected to be insignificant and discountable, ending when the dredging and disposal activities are completed. Similarly, because resident and wintering bald eagle populations in this area are likely acclimated to frequent boat traffic on the lower Snohomish River, Port Gardner Bay, Possession Sound, and Elliott Bay, no long-term effects on habitat suitability or bald eagle foraging behavior are expected. Noise and activity levels during the

dredging and disposal activities are expected to be within the range of recurrent ambient levels within these industrialized areas.

Although dredging and disposal activities could take place during early portion of the nesting season (January through February 14), survival and reproductive success of bald eagles at the nests closest to the dredging areas will be unaffected due to their distance from the dredging areas (all greater than two miles) and the disposal areas (all between one and two miles). Nesting bald eagles in these areas have repeatedly nested and fledged young from these highly industrialized and frequently disturbed shorelines. Thus, these birds are likely fairly acclimated to the passage of dredges and barges, and to frequent, temporary increases in noise levels. Similarly, bald eagles on Gedney Island and Duwamish Head are also unlikely to be disturbed by the slow transit of the bottom-dump barge to the disposal site and the release of sediment into the water column during dumping.

Long-term degradation of bald eagle habitat is also not expected. Bald eagle prey availability should also not be substantially affected while the benthic community reestablishes along the dredge channel and within the disposal areas. Use of the dredged material to contain the contaminated sediments at within the Marine Sediment Unit may ultimately limit the possible exposure of foraging bald eagles to bioaccumulated toxins in their food web.

For the reasons described in Section 5.4, no significant cumulative, interrelated or interdependent effects on the bald eagle are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

6.2.4 Take Analysis

Although foraging activities of bald eagles may be temporarily disturbed during dredging and disposal operations, this disturbance is not expected to significantly disrupt normal behavior patterns sufficiently to create the likelihood of injury or 'take' of any bald eagles. Therefore, the potential for incidental take in any form (including harassment) is considered negligible.

6.2.5 Conservation Measures

No specific conservation measures are warranted, because the potential for adverse effects on the bald eagle from short-term dredging and disposal operations is negligible. Conservation measures described in Section 6.5.5 for bull trout and Section 6.6.5 for chinook salmon are expected to also benefit bald eagles by limiting effects on their salmonid prey.

6.2.6 Effect Determination

Proposed maintenance dredging and disposal activities will not result in any long-term degradation of habitat or other significant adverse effects on bald eagles. Short-term effects such as noise disturbance and reduced prey availability will not occur or will be very small in magnitude, as discussed above. Temporary disturbance to foraging activities are expected to be insignificant and discountable. The survival or reproductive success of bald eagles in the project vicinity would not be affected.

Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** the bald eagle.

6.3 Marbled Murrelet

The marbled murrelet was listed as a threatened species in California, Oregon, and Washington under the Endangered Species Act of 1973, as amended in October 1992. Primary causes of population decline include the loss of nesting habitat in old-growth forests, and direct mortality from gillnet fisheries and oil spills while foraging in marine waters. Critical habitat for the marbled murrelet was officially designated on May 24, 1996. Designated critical habitat includes only terrestrial nesting habitat within designated critical habitat units and does not include marine foraging habitat. Marbled murrelet critical habitat includes 11 designated units in Washington State, including 1.2 million acres of Federal land, 421,500 acres of State forest land and 2,500 acres of private land.

6.3.1 Description of Species

The subspecies of marbled murrelet occurring in North America ranges from Alaska's Aleutian Archipelago to central California. Marbled murrelets forage in the near-shore marine environment and nest in inland old-growth coniferous forests of at least seven acres in size. Marbled murrelets typically forages for prey during the day and visits its nest site in the canopy of old-growth forests at dawn or dusk. Marbled murrelets nest in low-elevation, mature forests with multi-layered canopies; they select large trees with horizontal branches of at least seven inches in diameter and heavy moss growth and lay a single egg in the nest. April 1 through September 15 is considered nesting season; however in Washington, marbled murrelets generally nest between May 26 and August 27 (USFWS 1999b). Nesting trees in Washington State have been found as far as 30 miles from the ocean. Adults feeding young fly between terrestrial nest sites and ocean feeding areas primarily during the dawn and dusk hours.

Marbled murrelets spend most of their lives in the marine environment, where they forage in areas 0.2 to 1.2 miles offshore. Murrelets forage by pursuit diving in waters generally up to 260 feet deep. Murrelets often aggregate near localized food sources, resulting in a clumped distribution. Marbled murrelets feed on a wide variety of small fish and invertebrates, indicating their flexibility and capability to use alternative prey sources, including herring, sand lance, anchovy, osmerids, seaperch, sardines, rockfish, capelin, smelt, as well as euphasiids, mysids, and gammarid amphipods. Marbled murrelets also aggregate, loaf, preen, and exhibit wing-stretching behaviors on the water. While areas of marbled murrelet concentration at sea are likely determined by a combination of terrestrial and marine conditions, proximity to terrestrial nesting habitat appears to be the most important factor affecting marbled murrelet distribution and numbers.

Thus, although marine habitat is critical to marbled murrelet survival, USFWS' primary concern with respect to declining marbled murrelet populations is loss of terrestrial nesting habitat. Loss

of old growth nesting habitat, entanglement in drift gillnets, negative effects from exposure to contamination, and natural and anthropogenic (human-induced) variability in prey availability are concerns for this species.

6.3.2 Occurrence in the Project Area

Marine observations of murrelets during the nesting season are believed to correspond to the presence of large blocks of suitable nesting habitat inland. There are no suitable nesting areas within the vicinity of the lower Snohomish River, Port Gardner Bay, Possession Sound, or Elliott Bay. Similarly, no designated critical habitat (i.e. terrestrial nesting habitat) is located in or along the shores of Puget Sound, the Snohomish River, Possession Sound, or Elliott Bay. Designated critical habitat does not include marine foraging habitat.

The closest nesting areas to the lower Snohomish River are located between 13 and 30 miles to the east in the Cascade Mountains east of Lake Stevens and north of Sultan (approximately 34 records) and approximately 35 miles west in Olympic Mountains, west of Port Hadlock and Port Townsend (approximately 15 records) (WDFW PHS database search August 20, 2003).

The closest nesting areas to Elliott Bay are located approximately 35 to 40 miles to the east in the Cascade Mountains of King County (approximately eight nesting areas) and approximately 30 to 50 miles to the west in the Olympic Mountains of eastern Jefferson and Mason Counties (approximately 20-30 nesting areas) (Priority Habitats and Species database search June 5, 2003).

During the breeding season, marbled murrelets are present along almost all of Washington's marine shoreline, concentrated in areas with abundant food and nearby nesting habitat. These areas of concentration are Tongue Point and Voice of America on the Olympic Peninsula, the south shore of Lopez Island, the southwest shore of Lummi Island, and Obstruction and Peavine Passes between Orcas and Blakely Islands in the San Juan Islands (Seattle Audubon, www.birdweb.org).

In some, if not all portions of their range, marbled murrelets exhibit seasonal redistributions of their populations. In Washington, marbled murrelets move from the outer, exposed coasts of Vancouver Island and the Straits of Juan de Fuca into the sheltered and productive waters of northern and eastern Puget Sound (Speich and Wahl 1995). Areas of winter concentration are the southern and eastern end of the Strait of Juan de Fuca, Sequim (Clallam County), Discovery and Chuckanut Bays (Whatcom County), the San Juan Islands (San Juan County) and Puget Sound. The southern Washington coast is also considered an important wintering area (Seattle Audubon, www.birdweb.org). This may concentrate a large portion of the regional population into areas with heavy ship traffic, and increase their potential to encounter industrial and oil pollution in these sheltered waters.

Although appropriate foraging habitat is available in central Puget Sound, including Possession Sound, Port Gardner Bay, and Elliott Bay, marbled murrelets are not commonly seen in either of these areas, but could occur in the vicinity of the PSSDA or PSR Superfund disposal sites. The

industrialized nature and shallow depths of the lower Snohomish River make the occurrence of marbled murrelet in the vicinity of the proposed dredging extremely unlikely.

6.3.3 Analysis of Effects

Potential effects of the proposed maintenance dredging on marbled murrelets primarily include disturbance and increased turbidity during disposal of dredged sediments that may inhibit foraging or result in temporarily reduced food availability. Noise (running heavy equipment) and temporary increases in turbidity during dredging and disposal will likely cause prey fish to avoid the immediate area of the dredging and disposal operations. Consequently, in the unlikely event that a marbled murrelet was present within the immediate vicinity of the disposal areas, they would be expected to temporarily avoid the immediate area and forage elsewhere until disposal operations are completed.

Because the action area represents a small portion of the foraging habitat locally available for marbled murrelets within Puget Sound, any such interference with murrelet foraging activity is expected to be insignificant and discountable, ending when the dredging and disposal activities are completed. Noise and activity levels during the dredging and disposal activities are expected to be within the range of recurrent ambient levels within these industrialized areas.

Any interference with murrelet activity will end when dredging and disposal is completed. Marbled murrelet prey availability should also not be substantially affected while the benthic community reestablishes along the dredge channel and within the disposal areas. Long-term degradation of marine foraging habitat is not expected. Survival and reproductive success of marbled murrelet will be unaffected due to the lack of appropriate nesting habitat within the action area. Use of the dredged material to contain the contaminated sediments at within the Marine Sediment Unit may ultimately limit the possible exposure of foraging marbled murrelets to bioaccumulated toxins in their food web.

For the reasons described in Section 5.4, no significant cumulative, interrelated or interdependent effects on the marbled murrelet are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

6.3.4 Take Analysis

If marbled murrelets are present in Port Gardner Bay, Possession Sound, or Elliott Bay during disposal operations, foraging activities may be temporarily disturbed. However, this disturbance would not be expected to significantly disrupt normal behavior patterns sufficiently to create the likelihood of injury or ‘take’ of any marbled murrelets. Therefore, the potential for incidental take in any form (including harassment) is considered negligible.

6.3.5 Conservation Measures

No specific conservation measures are warranted, because the potential for adverse effects on the marbled murrelet from short-term dredging and disposal operations is negligible. Conservation

measures described in Section 6.5.5 for bull trout and Section 6.6.5 for chinook salmon are expected to also benefit marbled murrelets by limiting effects on their fish prey.

6.3.6 Effect Determination

Proposed maintenance dredging and disposal activities will not result in any long-term degradation of habitat or other significant adverse effects on marbled murrelets. Short-term effects such as noise disturbance and reduced prey availability will not occur or will be very small in magnitude, as discussed above. Temporary disturbance to foraging activities are expected to be insignificant and discountable. The survival or reproductive success of marbled murrelets in the project vicinity would not be affected.

Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** the marbled murrelet. Similarly, the proposed maintenance dredging and disposal activities are **not likely to adversely modify** marbled murrelet critical habitat as the proposed activities would not occur within designated critical nesting habitat or surrounding forested areas.

6.4 Steller Sea Lion

6.4.1 Description of Species

The Steller sea lion (*Eumetopias jubatus*) is the only living species of the genus *Eumetopias*. The closest relatives of the Steller sea lion include the other sea lion genera, including *Zalophus*, *Otaria*, *Neiphoca* and *Phoscartos*, and fur seals of the genera *Coorhinus* and *Arctocephalus*. Evidence suggests that Steller sea lions evolved only in the North Pacific and the species may be 3 to 4 million years old (Loughlin et al. 1987; Repenning 1976).

The Steller sea lion was listed as threatened under the Endangered Species Act on November 26, 1990. The listing followed a decline of about 64% in the U.S. population over a period of roughly three decades. In 1997, the population of SSL in the North Pacific region was split into two separate stocks by NMFS, based on demographic and genetic differences (Bickham et al. 1996, Loughlin 1997). The stock separation resulted in the status of the western stock (Kenai-to-Kiska region; west of 144 degrees west longitude) being changed to endangered, leaving the status of the eastern stock unchanged as threatened. Thus, all stocks to the east and south of Prince William Sound, including those inhabiting the waters of Puget Sound and the Washington coast, remained classified as threatened. In the waters off southeast Alaska, Washington, Oregon, and California, no critical habitat is currently identified.

Steller sea lions are distributed throughout the North Pacific Ocean, particularly along coastal waters and offshore of the North Pacific Rim nations, extending from the Channel Islands off California to Japan's northern island of Hokkeido. The most southern rookeries are on Ano Nuevo Island in California.

Land sites used by Steller sea lions are referred to as rookeries and haul-outs. Rookeries are used by adult sea lions for reproductive activity and by adult females for pupping and nursing from late May until July. Haul-outs are used by the entire SSL community as onshore rest areas, for socializing, but generally are not used for breeding. The breeding range of the SSL covers virtually all of the North Pacific Rim from about 34°N to 60°N latitude.

Results of tagging studies have suggested that Washington's Steller sea lion population may be an important mixing and foraging site for populations that generally breed in Oregon, British Columbia and southeast Alaska. Although animals of all ages have been observed in the Washington population, no breeding rookeries have been identified in Washington.

A number of factors have been proposed for the cause of the SSL population decline including contaminants, incidental catch, disease, purposeful shootings, predation by toothed whales, government-authorized kills, and environmental changes. Although the key factors leading to the species' decline may have changed over time and space, NOAA Fisheries and some other scientists have generally felt that the decline involves a nutritional deficiency that has resulted from lack of abundance or availability of suitable prey. Thus, any activity that is seen to significantly reduce prey availability to Steller sea lions may be determined to place the species, or stocks of the species, in jeopardy.

6.4.2 Occurrence in the Project Area

It appears the Steller sea lion population found at Washington varies significantly throughout the year and perhaps between years. Steller sea lions are known to migrate into Puget Sound and have been seen in many inland water areas, including the San Juan Islands, rock outcroppings along the Strait of Juan de Fuca, near Everett, in Shilshole Bay, off the Ballard Locks and occasionally in south Puget Sound. There are no known annual counts and, as with the offshore area, their movements into Puget Sound seem sporadic. Following the large El Nino of 1985-1986, several hundred animals were reported to have appeared in south Puget Sound.

Steller sea lions may occasionally be found on navigation buoys in Puget Sound. Documented locations include: in the western Strait of Juan de Fuca around Pachena Point, on the Toliva Shoals buoy off the south tip of Fox Island, south of Gig Harbor, and several areas in southern British Columbia, including Race Rocks southeast of Becher Bay, Trial Island off of Victoria, and the Belle Chain area of the Gulf Islands (Jeffries et al. 2000). Thus, although Puget Sound falls within the distribution of Steller sea lion, their numbers in the region are generally small and mostly concentrated in the northern portion of Puget Sound and the Strait of Juan de Fuca.

According to Gearin and Jeffries (1996), peak monthly counts indicate that Steller sea lions are most abundant off Washington during March-April and August-November. Steller sea lions may be observed along the Washington coast year around, but they are least abundant in May-July, which corresponds to the breeding time off Oregon and British Columbia.

Steller sea lions use haul out sites primarily along the outer Washington coast, from the Columbia River to Cape Flattery, as well as along the Vancouver Island side of the Strait of Juan

de Fuca. Breeding rookeries do not occur in Washington, with the Oregon and British Columbia coasts being the closest breeding locations (Jeffries et al. 2000).

6.4.3 Analysis of Effects

Potential effects of the proposed maintenance dredging on Steller sea lions primarily include disturbance during haul out and inhibited foraging due to disturbance and increased turbidity during disposal of dredged sediments. Noise (running heavy equipment) and temporary increases in turbidity during dredging and disposal will likely cause prey fish to avoid the immediate area of the dredging and disposal operations. Consequently, in the unlikely event that a Steller sea lion was present within the immediate vicinity of the disposal areas, they would be expected to temporarily avoid the immediate area and forage or haul out elsewhere within the marina until disposal operations are completed.

Because the action area represents a small portion of the foraging habitat locally available for Steller sea lions within Puget Sound and they do not commonly forage within this area, any such interference with Steller sea lion foraging activity is expected to be insignificant and discountable, ending when the dredging and disposal activities are completed. Noise and activity levels during the dredging and disposal activities are expected to be within the range of recurrent ambient levels within these industrialized areas and are thus not expected to affect the rare Steller sea lion that could be present within the action area during dredging or disposal activities.

In the unlikely event that Steller sea lions were hauled out on the docks near the downstream settling basin, any temporary disturbance with their activities will end when the dredging is completed. Steller sea lion prey availability should also not be substantially affected while the benthic community reestablishes along the dredge channel and within the disposal areas. Long-term degradation of marine foraging habitat is not expected. Survival and reproductive success of the Steller sea lion will be unaffected due to the lack of any breeding rookeries within the action area. Use of the dredged material to contain the contaminated sediments at within the Marine Sediment Unit may ultimately limit the possible exposure of foraging Steller sea lions to bioaccumulated toxins in their food web.

For the reasons described in Section 5.4, no significant cumulative, interrelated or interdependent effects on the Steller sea lion are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

6.4.4 Take Analysis

If Steller sea lions are present in Port Gardner Bay, Possession Sound, or Elliott Bay during disposal operations, foraging activities may be temporarily disturbed. However, this disturbance would not be expected to significantly disrupt normal behavior patterns sufficiently to create the likelihood of injury or ‘take’ of any Steller sea lions. Therefore, the potential for incidental take in any form (including harassment) is considered negligible.

6.4.5 Conservation Measures

No specific conservation measures are warranted, because the potential for adverse effects on the Steller sea lion from short-term dredging and disposal operations is negligible. Conservation measures described in Section 6.5.5 for bull trout and Section 6.6.5 for chinook salmon are expected to also benefit Steller sea lions by limiting effects on their fish prey.

6.4.6 Effect Determination

Proposed maintenance dredging and disposal activities will not result in any long-term degradation of habitat or other significant adverse effects on Steller sea lions. Short-term effects such as noise disturbance and reduced prey availability will not occur or will be very small in magnitude, as discussed above. Temporary disturbance to foraging activities are expected to be insignificant and discountable. The survival or reproductive success of Steller sea lions would not be affected.

Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** Steller sea lions.

6.5 Bull Trout – Coastal/Puget Sound Distinct Population Segment

6.5.1 Description of Species

Bull trout (*Salvelinus confluentus*) are native char and are part of the salmonid family. Bull trout were historically found throughout the Pacific Northwest, from Northern California to the upper Yukon and Mackenzie drainages in Canada. Inland populations were found in Idaho, Montana, Utah, and Nevada. Bull trout may be extirpated in California, and have declined in numbers in much of their range, especially along its southern limits (McPhail and Baxter 1996); bull trout have probably been extirpated from parts of their former range in Washington, such as Lake Chelan and the Okanogan River. The USFWS issued the determination of threatened status in the federal register on November 1, 1999 (FR 64 [210]: 58910-58933).

Bull trout have more specific habitat requirements as compared to other salmonids, generally restricting their spawning and juvenile rearing to high quality habitats. Particularly important requirements are water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors. Bull trout prefer deep pools of cold rivers, lakes, and reservoirs, often seeking out the coldest water in a watershed (USFWS 1999a). Streams with abundant cover (cut banks, root wads, and other woody debris) and clean gravel and cobble beds provide the best habitat. Their preferred summer water temperature is generally less than 55° Fahrenheit, while temperatures less than 40° Fahrenheit are tolerated. Spawning during fall usually starts when water temperatures drop to the mid- to low-40s. Cold, clear water is required for successful reproduction (USFWS 1999a).

Juvenile bull trout, particularly young of year, also have very specific habitat requirements. Small bull trout are primarily bottom-dwellers, occupying positions above, on, or below the

stream bottom. Good hiding cover is also important to all life stages of all forms of bull trout. Fry and juveniles can be found in pools or runs in close proximity with cover provided by boulders, cobble, large woody debris, and undercut banks. Age 1+ and older juveniles utilize deeper, faster water than underyearlings, often in pools with shelter-providing large organic debris or clean cobble substrate. In large rivers, the highest abundance of juveniles can be found near rocks, along the stream margin, or in side channels (Pratt, 1984, 1992; Goetz, 1994).

6.5.1.1 Use of Estuarine Areas by Juvenile Bull Trout

Current information suggests that bull trout first enter tidally influenced waters in Puget Sound as age-2 fish, at sizes ranging from 110 to 200 mm (Kraemer 2003; Yates 2001; Tanner et al. 2002; E. Jeanes, R2 Resource Consultants, Mindy Rowse, NOAA, E. Beamer, Skagit Systems Cooperative, unpublished data). The seasonal timing of entry extends from mid-February to early September, with the vast majority of juvenile fish entering tidal waters between April and July. A cumulative frequency analysis of WDFW catch data (over 2000 fish) from a scoop trap on the Skagit River near Mt. Vernon shows that 98 percent of all the fish were captured between April 1 and July 31 with approximately 0.2 percent captured in February and 1.0 percent in March and 0.6 percent in August and September (Dave Seiler, WDFW, unpublished data).

Upon entry the juvenile fish may elect to rear in the tidally influenced delta within intertidal marsh, distributary channels, or along mainstem habitat areas, or may pass through these areas into nearshore marine wateres. Larger juveniles may elect to migrate substantial distances through the nearshore marine environment from their natal river basin to adjacent areas. The longest documented migration of a larger juvenile or small sub-adult bull trout was from one of the western Olympic Peninsula Rivers, Quinault, Hoh, or Queets River, to the Willapa River. A single fish approximately 200-250 mm was captured at RM 29 in the Willapa River in May 2002 (J. Chan, USFWS, pers. comm.), this fish would have migrated a minimum of 60 to 100 miles from a known spawning river to get to the Willapa River.

6.5.1.2 Habitat Use

Floodplain Areas

There has been little information available regarding the use of off-channel floodplain areas by migratory (fluvial, adfluvial, and anadromous) bull trout in larger mainstem rivers. Prior to 2002, reports of bull trout use of floodplain areas in western Washington were not available. Recent review of gray literature and personal contacts shows that sub-adult and adult bull trout use lower elevation floodplains in freshwater and tidally influenced areas.

Subadult bull trout have been observed or captured in three restored and two natural tidal channels and in larger distributary channels of the Snohomish and Skagit Rivers, including locations upstream of the upstream settling basin: 1) the Snohomish River, in two small tidal channels off Ebey Slough, a large distributary channel that connect with Steamboat Slough (M. Rowse, NMFS, unpublished data); 2) the Snohomish River, in Union Slough during the first spring after dike removal and restoration of a previously isolated floodplain area on Spencer Island (Tanner et al. 2002); 3) the Snohomish River, subadult and adult bull trout have used portions of all three distributary channels – Union, Steamboat, and Ebey Sloughs in upstream

and downstream migratory movements during spring, summer and fall, 2002 (F. Goetz, USACE, unpublished data); 4) the South fork Skagit, in Deepwater Slough, a moderate-sized tidal channel in a floodplain area previously isolated from the river and tides until reconnection occurred in October 2000 as part of a estuary restoration project (J. Klochak, Skagit System Cooperative, pers. comm.); 5) the Skagit River, adult and subadult bull trout have been recorded migrating through both forks during upstream and downstream migratory movements (F. Goetz, USACE, unpublished data).

Nearshore Marine Areas

Subadult and adult bull trout that enter marine areas pass through or use a wide range of habitats for short or longer-term habitation. The Seattle District Corps has been conducting a multi-year acoustic telemetry study of sub-adult and adult bull trout use of nearshore marine waters from the Snohomish River to Padilla Bay.

Preliminary results indicate that the depth of water used by bull trout may change by time of day and may vary by age class. During one nearshore marine tracking survey, the largest tagged fish was found to occupy depths of 30 to 60 feet, a moderate sized was found at 10 to 20 feet and a subadult was found at 5 to 10 feet. The largest tagged fish was found to vary its depth by time of day, with the greatest depths occurring during daylight hours and the shallowest depths at night.

Data from that study has also shown that fish tracked in nearshore and lower river areas were not found at temperatures exceeding 60° F except for one observation at 64° F. During their documented marine residence phase, March to July, tagged bull trout have been found in salinities from 1 to 28 parts per trillion (ppt) – during this time period salinity does not appear to be limit the habitats bull trout may elect to use. Substrate class also does not appear to be important to selection of feeding areas or home territories (see below), as fish were found using substrates from mud, to sand, to large gravels. Turbidity levels also do not appear to influence the habitats selected by sub-adult and adult fish, as the highest density of tagged fish during the study was found in a high turbidity area of Snohomish River delta.

6.5.1.3 Prey

Bull trout utilize the productive shallow waters or estuaries and nearshore marine areas to forage on a variety of prey items, but appear to target juvenile salmonids and small marine fish such as herring, sand lance, and surf smelt, especially keying in on forage fish spawning beaches (Kraemer 1994). Evidence suggests that June is a month where bull trout may aggregate in the outlet of major estuaries seeking outmigrating juvenile salmon as a preferred prey source.

In the Seattle District acoustic telemetry study, the highest density of tagged fish were found in an aggregation at the outlet of the Snohomish River at the peak of the juvenile chinook salmon outmigration in late June 2002. In 2001 at Shilshole Bay, the highest number of adult bull trout caught at one time (three fish in one seine haul), were caught immediately below the smolt passage way at the beginning of the peak chinook salmon migration (F. Goetz, USACE, pers. comm.). Only one published report has examined bull trout stomach contents and published the results (Footen 2000, 2003) -these fish ate 40 percent salmon and 60 percent forage fish – sand

lance and surf smelt. Recent analysis from the Hoh River shows that late winter prey by bull trout found in the lower river is 95 percent surf smelt (S. Brenkman, NPS, pers. comm.).

6.5.2 Occurrence in the Project Area

6.5.2.1 Distribution of Bull Trout in Puget Sound

The current distribution of bull trout within Puget Sound marine waters is not completely known, but has been documented from the Canadian border to at least the Nisqually River delta to the south. Bull trout migrate and are captured throughout the inner bays of northeast Puget Sound from Possession Sound, Port Susan, Skagit Bay, Padilla Bay, out to Whidbey Island (F. Goetz, USACE, unpublished data). One bull trout tagged in the Nooksack River was later recovered in the Lower Fraser River (N. Currence, Nooksack Tribe, pers. comm., 2003). It is thought that bull trout primarily use the shallower nearshore waters along the eastern shore of Puget Sound (waters less than 100 feet deep), and occasionally use or cross deeper waters (up to 100 foot depth) to access locations along the westside of Whidbey Island. It is unknown if individuals from Puget Sound populations migrate to the west side of Puget Sound as far west as the Straits of Juan de Fuca, and to what extent they may migrate up the coast of British Columbia.

Within the Snohomish River basin, reproducing populations of bull trout are found in the upper North Fork Skykomish River mainstem and its tributaries between Bear Creek Falls and Deer Creek Falls; 1993 telemetry work documented spawning in the lower East Fork Foss River, tributary to the South Fork Skykomish River (WDFW 1998). Bull trout may also use the estuaries and reaches of river systems that have not historically or currently supported spawning populations of bull trout, such as the Samish River, Shilshole Bay, and Duwamish River. Bull trout are believed to be foraging on juvenile salmonid downstream migrants or other fish species while occupying these areas.

6.5.2.2 Distribution and Movement of Bull Trout in the Lower Snohomish River

The following information is based on preliminary results of the Seattle District Corps' acoustic telemetry study of bull trout in the Snohomish River estuary and nearby marine areas, conducted as part of the Corps strategy to minimize potential affects on bull trout and address concerns raised by USFWS during previous consultations for the maintenance dredging project.

Data from the Seattle District study has shown that sub-adult and adult bull trout show a variety of migratory behaviors in estuary and marine waters, as described in more detail below, including: 1) inter-basin migrations through marine waters whereby fish using a particular estuary may have come from multiple nearby river basins, 2) periodic movement between fresh and saltwaters, returning to non-natal rearing areas during the winter, 3) selection of a territory they may occupy for up to four months (winter, spring, and early summer) and that they may return to year after year.

Inter-basin Migrations Through Marine Waters

Migration by individual bull trout between river basins is a frequent occurrence in fresh water and is well documented. However, prior to this recent study, migration by bull trout between basins through estuarine and marine waters has had little documentation. In the first two years (2002-2003) of the Seattle District acoustic telemetry study in the Snohomish River estuary and nearby marine areas, over 50 percent of the reported detections for fish who left the Snohomish River estuary during late spring and early summer have occurred in the Skagit and Stilliguamish River basins. These fish (sub-adult and adult) have been reported or detected throughout the Skagit River basin, from the Whitechuck River, Upper Sauk, mainstem Skagit below Baker River, down to the estuary. These fish were originally tagged at various places including the upper and lower Snohomish River and the nearshore marine shoreline north of the estuary (Port Susan). Bull trout tagged in the nearshore marine areas have been found entering and using the lower Stillaguamish River. Based on these initial study results, there is likely a large degree of mixing of core-populations within estuarine and marine nearshore areas of Puget Sound. This same type of interbasin transfer is also being documented by radio telemetry in rivers of the West Olympic Peninsula (S. Brenkman, NPS, pers. comm.).

Similarly, in the first year of study, 98 percent of all tagged fish (49 of 50) left the tidally influenced areas by July 31, migrating upstream into the Skagit and Skykomish Rivers, with one fish remaining in freshwater tidal areas until August 12. We believe these fish were either seeking spawning areas or thermal refuge from warmer lower river temperatures. Thus, the majority of the tagged fish moved out of the areas which would be impacted by the proposed dredging well before the opening of the proposed dredging period (October 16 through February 14).

Periodic movement between fresh and saltwater

Bull trout may move downriver and/or reenter marine waters for a limited period during fall in response to the onset of fall rains or freshets. This fall weather change resulted in fish movement from upriver areas to mostly lower river sites (at or above freshwater tidal) in 2003, with a small number of fish reentering marine waters to return to previous spring foraging areas.

During mid-November 2002, up to 20 of the tagged bull trout (out of 60 fish tagged, 50 fish redetected) moved downstream, with four fish reentering marine waters for a brief period of time. Their movement occurred immediately after the first rain and consequent increase in river flow following four months of drought. The first rain in four months occurred on November 7, river flows were near a 60-year low, and river flows showed an increase beginning November 8, with highest flows occurring on November 20 and 21.

The majority of the tagged fish moved downstream only to the edge of tidal influence or above (RM 11 in the Skagit River, at or above RM 15 in the Snohomish River). The four bull trout that reentered marine waters did so on November 7, 9, 15, and 21, 2003, corresponding to onset of the rain and the increase in river flow. Three of the fish returned to marine waters from the Snohomish River and one from the Skagit River. Several of these fish returned to the marine areas where they were originally tagged in the spring of 2002. All of these fish then moved back

upstream to freshwater areas by early December and did not reenter marine areas again until early March 2003.

The first fish reentering marine water left the Skagit River on November 7 and was detected in the upper Snohomish River on November 21. This fish was originally tagged in the upper Snohomish River in spring 2002 and left the Snohomish River on April 14, 2002. It appears to have spent the summer in the Skagit River near Sedro Wooley, and then returned to the upper Snohomish River between November 7 and 21. It then spent the winter rearing in the upper Snohomish River, and then returned to marine waters on April 1, 2003.

The second fish was heard in lower Skagit River on November 9, 2002. It had been tagged at Kayak Point (between the Snohomish River and the Stilliguamish River) the previous spring, had left marine waters in late July 2002 to return to the Skagit River. It then left the Skagit River on November 9, was detected at Kayak Point on November 15, was heard intermittently until December 12, and was not heard again at Kayak Point until April 14, 2003.

The third fish was heard on November 15, 2002 at Kayak Point, it reentered the upper Snohomish River on November 19. The fourth fish was detected in Steamboat Slough on November 21, 2002 and had returned to the upper Snohomish River by November 27, 2002.

Selection of a feeding territory

Bull trout may home to a feeding territory that they may occupy for up to four months (winter, spring, and early summer). Examples of these territories were found in all areas of the estuary - freshwater tidal, brackish intertidal, and nearshore marine. Both adult and sub-adult fish displayed this behavior. Bull trout may also return to this feeding territory year after year. Approximately ten percent of all tagged fish returned to the location of tagging the previous year. These territories may range in size from 1 to 2 kilometers in size and from 100 to 500 meters in shoreline length.

6.5.3 Analysis of Effects

Bull trout migrate through the lower Snohomish River to and from upper basin areas that may include spawning areas in the upper North Fork and South Forks of the Skykomish River. The Corps telemetry study has documented their use of the lower river and estuary for foraging, particularly during periods of juvenile salmonid out-migration. However, it is unlikely that either juvenile or adult bull trout would occur in the settling basins or adjacent portions of the navigation channel their during the proposed dredging period (October 16 to February 14) based on the lack of out-migrating juvenile salmonids to prey upon and on the migratory behavior of bull trout observed in the Corps recently completed telemetry study. The observation that 98 percent of all tagged fish left the tidally influenced areas by July 31, and at the latest by August 12 supports this conclusion.

While some bull trout may move downstream in response to the onset of fall rains, the majority of the fish in which we documented this behavior moved downstream only as far as the upper

limit of tidal influence (at or above RM 15 in the Snohomish River and at RM 11 in the Skagit River), well upstream of the areas of proposed dredging (up to RM 6.3). The four fish that moved completely or partially through the estuary toward marine waters did so during the early portion of the dredging window (mid-November), returned to the upper basin by early December, and then did not reenter marine areas again until early March 2003. Except for these brief periods of movement in response to rainfall/high flow events, the results of the telemetry study indicate that bull trout are not present within the lower Snohomish River during the period of the proposed dredging.

The occasional adult or sub-adult bull trout which may be migrating through the lower Snohomish River during the period of the dredging operations is likely to avoid the area of the dredge and its zone of temporarily increased turbidity. They would be able to avoid the dredging area by seeking refuge over the shallow intertidal areas along either side of the navigation channel and settling basins. Foraging habitat, such as these intertidal areas, would not be affected by the dredging. Populations of prey important to bull trout (juvenile salmon and forage fish) are unlikely to be affected by the proposed dredging and disposal operations (see Sections 5.3.1.1 and 5.3.3).

Similarly, bull trout within the vicinity of the disposal sites (either the PSR Superfund site in Elliott Bay or the PSSDA site in Port Gardner Bay) would be expected to move out of the area of the bottom dump barge as sediments are falling through the water column; bull trout would not be expected to be in the deeper waters where the sediments would settle. Use of the dredged material to contain the contaminated sediments at within the Marine Sediment Unit may ultimately limit the possible exposure of bull trout to bioaccumulated toxins in their food web.

This information, in combination with the conservation measures described below in Section 6.5.5, particularly avoidance of the juvenile salmon migration period, is expected to prevent adverse short-term effects to bull trout during dredging and disposal operations. The temporary loss of the benthic and forage fish communities during dredging is expected to have a negligible effect on long-term habitat quality within the action area. Overall, the effects of the proposed action would be insignificant and discountable due to the temporary duration of the dredging activities and the implementation of the proposed conservation measures to minimize the potential for bull trout to be within the action area during dredging.

6.5.4 Take Analysis

If the proposed dredging operations were to be conducted during migration periods, bull trout could be susceptible to short-term harassment during their migration periods. Maintenance dredging could create the likelihood of injury to such an extent as to significantly disrupt normal behavior patterns during peak migration periods. However, adoption of the conservation measures list below (Section 6.5.5), particularly avoidance of the juvenile salmon migration period, reduces the potential for incidental take in the form of harm or harassment of bull trout to a negligible level.

6.5.5 Conservation Measures

Measures incorporated into the proposed action, including the dredging scheduling and Water Quality Certification conditions, would reduce the incremental effects such that there would be minimal effects on bull trout. Avoiding dredging during peak salmonid outmigration periods would minimize the short-term effects of the proposed action on bull trout. The proposed dredging would be conducted between October 16 and February 14. Dredging during peak juvenile salmon migration months between February 15 and July 15 (or as designated by NOAA Fisheries, USFWS, or WDFW) would thus be avoided. This timing would also avoid noise impacts to juvenile salmonids.

The principal water quality impact of dredging is increased suspended solids concentrations in waters near the dredging site. The effects of dredging on water quality can occur at the site of dredging and transfer to the barge and barge overflow or decant water discharge. The dredging for this project would be accomplished with a clamshell dredge in FY 2004 where sediments may be resuspended into the water column through lowering of the clamshell bucket, impacting the bottom with the bucket, closing the bucket, raising the bucket through the water column, and depositing sediments onto the haul barge. In FY 2005, and possibly in subsequent years, dredging could be accomplished with hydraulic pipeline dredge to allow for direct placement of material at upland sites. Sediments would be resuspended into the water column by the cutterhead/water jets used to break up the sediment surface prior to suctioning through a large hose for placement at the designated upland site.

These effects are all temporary and localized. They are limited in time to periods outside the migration period for juvenile salmonids and are limited in space to the immediate vicinity of dredging activities. Temporary effects on water quality and salmonids would also be minimized by adherence to all permit conditions and by additional measures, which are detailed below:

(1) Dredging would be done with a clamshell dredge, and would be carried out in a manner that minimizes spillage of excess sediments from the bucket and minimizes entrainment of fish.

(2) If the potential for beneficial use of the dredged material necessitates hydraulic dredging (to allow for direct placement of materials), the Corps will provide supplemental information to NOAA Fisheries and USFWS detailing the method of dredging, as well as the location, elevation, volume, and placement specifics of any future proposal to use dredged materials beneficially on Jetty Island or at any of the upland sites.

(3) Barges used to transport the dredged material to the disposal or transfer sites would not be filled beyond their capacity to completely contain the dredged material.

(4) Disposal operations and material effects would be in conformance with PSDDA management standards.

(5) Other conditions as may be included in the Section 401 Certification issued by the Washington State Department of Ecology (WDOE) for this project (see description in Section 5.1.1).

(6) Dredging would be carried out in compliance with permits issued by the responsible regulatory agencies. These permits may include additional conditions to protect water quality.

6.5.6 Effect Determination

Through the Corps telemetry study, sub-adult and adult bull trout have been documented in the lower Snohomish River and the larger action area. Therefore, the project may affect the threatened Coastal/Puget Sound bull trout. However, any bull trout present during dredging operations would experience negligible effects, as described in Section 6.5.3.

Conservation measures (as described in Section 6.5.5), including avoiding dredging during the migration period of juvenile salmonids, would prevent adverse short-term effects to bull trout during dredging operations. Dredging would result in temporary degradation of the water quality; these effects would be limited to the immediate dredging site and bull trout are believed to readily be able to avoid areas with temporarily degraded water quality conditions. The temporary loss of the benthic and forage fish communities in the dredging areas would have only a negligible effect on bull trout habitat, especially since juvenile bull trout forage mainly outside of the navigation channel. In the event that an occasional bull trout would be migrating through the dredging areas in response to rainfall events, they would be expected to readily avoid the project area during dredging operations by utilizing undisturbed habitats along the edges of the navigation channel.

For the reasons described in Section 5.4, no significant cumulative, interrelated or interdependent effects on bull trout are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

Overall, the effects of the proposed action on Coastal/Puget Sound bull trout would be insignificant and discountable. Therefore, the proposed maintenance dredging activities **may affect, but is not likely to adversely affect** Coastal/Puget Sound bull trout.

6.6 Chinook Salmon

6.6.1 Description of Species

Like all Pacific salmon, chinook reproduce in fresh water but spend the majority of their life cycle in the marine environment. Chinook remain at sea an average of two to four years before returning to their natal stream to spawn. Chinook salmon prefer to spawn and rear in the mainstem of rivers and larger streams (Williams et al. 1975, Healey 1991). Chinook are generally classified either as ocean or stream type. Ocean-type fish are characterized by a short juvenile freshwater residence time and normally migrate to estuarine areas within their first year

(usually around three to four months after emergence from spawning gravel). They typically return to their natal stream a few days or weeks before spawning. Stream-type chinook typically spend one or more years in fresh water before migrating to the sea and often return to their natal streams several months prior to spawning. The majority of Puget Sound chinook salmon including those from the Snohomish River are ocean-type, which migrate out of the river, through the estuary, and into marine waters as sub-yearlings.

Estuaries are an important rearing habitat for all species of salmon, but chinook are probably the most dependent on this type of habitat (Healy 1982). Rivers with well-developed estuaries are generally able to sustain larger ocean-type populations than those without. Salmon use estuaries for rearing, refuge from predators, and as a physiological transition area (Simenstad et al 1982). Juvenile chinook rear in estuaries for a period of days to two months. They range in size from 35 to 160 mm in length when entering the estuary (Beauchamp et al 1983). Ocean-type chinook are usually smaller and tend to utilize estuaries and coastal areas more extensively for rearing than stream-type juveniles (Healey 1991).

Chinook smolts spend a prolonged period (several days to several weeks) during their spring outmigration feeding in saltmarshes and distributary channels as they gradually transition into marine waters. Rapid growth also occurs in estuaries due to the abundance of preferred prey including larval and adult insects and epibenthic crustaceans such as gammarid amphipods, mysids, and cumaceans. As chinook juveniles mature and move into marine waters, they feed on drifting insects and small nektonic organisms (calanoid copepods, crab larvae, larval and juvenile fish, and euphausiids) (Simenstad et al. 1982, Healey 1991).

6.6.2 Occurrence in Project Area

The natural spawning populations of chinook salmon within the Snohomish River system are separated into four distinct stocks: Snohomish summer chinook, Snohomish fall chinook, Bridal Veil Creek fall chinook, and Wallace River summer/fall chinook (WDFW 1994 SASI).

Snohomish River summer chinook are considered to be a native stock, and are listed as a depressed stock (WDFW 1994 SASI). Snohomish summer run fish spawn in September from Larimer Creek to the confluence of the Skykomish and Snoqualmie Rivers and in the Skykomish from the mouth to Austin Creek (WDFW 1994 SASI, Priority Habitat and Species database search August 22, 2003).

Snohomish River fall chinook are also considered to be a native stock, and are also listed as a depressed stock (WDFW 1994 SASI). The Snohomish River fall run spawns from mid-September through October in the Snoqualmie River, Sultan River, Pilchuck River, Woods Creek, and Elwell Creek (WDFW 1994 SASI, Priority Habitat and Species database search August 22, 2003). Quilceda Creek and Allen Creek are listed in the Streamnet Data from WDFW as also supporting fall chinook spawning (Priority Habitat and Species database search August 22, 2003).

The Wallace River run is considered a mixture of stocks resulting from hatchery straying, including Green River fall chinook. The stock's status is considered healthy. The Wallace River run (tributary to the Skykomish) spawn throughout September and October from the mouth to

Onley Creek (WDFW 1994 SASI, Priority Habitat and Species database search August 22, 2003).

The Bridal Veil Creek stock is considered a native stock and is genetically distinct from all other Puget Sound chinook stocks. The stock status is unknown due to a lack of data. Bridal Veil Creek fall chinook also spawn from late September through October, with the peak the second week of October. They spawn in Bridal Veil Creek, the south fork of the Skykomish River, the area above Sunset Falls, and in the North Fork of the Skykomish from the forks to Bear Creek (WDFW 1994 SASI, Priority Habitat and Species database search August 22, 2003).

Thus, adult chinook are migrating into the Snohomish River estuary and upstream to their natal streams between September and October. Juvenile chinook salmon are generally then present in the Snohomish River estuary from March through July or August, with peaks in outmigration generally occurring in May and June.

In Puget Sound, designated critical habitat for chinook salmon includes all marine, estuarine, and river reaches accessible to the species. Thus, all of the waters within the project area are within the designated critical habitat for chinook salmon.

6.6.3 Analysis of Effects

The occurrence of adult chinook migrating through the action area during the dredging period (October 16 to February 14) is unlikely based on the timing of adult upstream migration (July through September) and spawning (September and October). Any late migrating adult or sub-adult chinook salmon within the lower Snohomish River during the period of the dredging operations are likely to avoid the area of the dredge and its zone of temporarily increased turbidity. They would be able to avoid the dredging area by seeking refuge over the shallow intertidal areas along either side of the navigation channel and settling basins. Juvenile foraging habitat, such as these intertidal areas, would not be affected by the dredging. Populations of prey important to juvenile and adult chinook salmon (invertebrates and forage fish) may be affected by the proposed dredging and disposal operations, but these effects are expected to be insignificant and discountable due to their brief and temporary nature (see Sections 5.3.2 and 5.3.3). Similarly, chinook salmon within the vicinity of the disposal sites (either the PSR Superfund site in Elliott Bay or the PSSDA site in Port Gardner Bay) would be expected to move out of the area of the bottom dump barge as sediments are falling through the water column; chinook salmon would not be expected to be in the deeper waters where the sediments would settle. Use of the dredged material to contain the contaminated sediments at within the Marine Sediment Unit may ultimately limit the possible exposure of chinook salmon to bioaccumulated toxins in their food web.

This information, in combination with the conservation measures described below in Section 6.5.5, particularly avoidance of the juvenile salmon migration period, is expected to prevent adverse short-term effects to chinook salmon during dredging and disposal operations. The temporary loss of the benthic and forage fish communities during dredging is expected to have a negligible effect on long-term habitat quality within the action area. Overall, the effects of the proposed action would be insignificant and discountable due to the temporary duration of the

dredging activities and the implementation of the proposed conservation measures to minimize the potential for chinook salmon to be within the action area during dredging.

6.6.4 Take Analysis

If the proposed dredging operations were to be conducted during migration periods, chinook salmon could be susceptible to short-term harassment during their migration periods. Maintenance dredging could create the likelihood of injury to such an extent as to significantly disrupt normal behavior patterns during peak migration periods. However, adoption of the conservation measures list below (Section 6.5.5), particularly avoidance of the juvenile salmon migration period, reduces the potential for incidental take in the form of harm or harassment of chinook salmon to a negligible level.

6.6.5 Conservation Measures

Measures incorporated into the proposed action, including the dredging scheduling and Water Quality Certification conditions, would reduce the incremental effects such that there would be minimal effects on chinook salmon. Avoiding dredging during peak salmonid outmigration periods would minimize the short-term effects of the proposed action on chinook salmon. The proposed dredging would be conducted between October 16 and February 14. Dredging during peak juvenile salmon migration months between February 15 and July 15 (or as designated by NOAA Fisheries, USFWS, or WDFW) would thus be avoided. This timing would also avoid noise impacts to juvenile chinook salmon.

The principal water quality impact of dredging is increased suspended solids concentrations in waters near the dredging site. The effects of dredging on water quality can occur at the site of dredging and transfer to the barge and barge overflow or decant water discharge. The dredging for this project would be accomplished with a clamshell dredge in FY 2004 where sediments may be resuspended into the water column through lowering of the clamshell bucket, impacting the bottom with the bucket, closing the bucket, raising the bucket through the water column, and depositing sediments onto the haul barge. In FY 2005, and possibly in subsequent years, dredging could be accomplished with hydraulic pipeline dredge to allow for direct placement of material at upland sites. Sediments would be resuspended into the water column by the cutterhead/water jets used to break up the sediment surface prior to suctioning through a large hose for placement at the designated upland site.

These effects are all temporary and localized. They are limited in time to periods outside the migration period for juvenile chinook salmon and are limited in space to the immediate vicinity of dredging activities. Temporary effects on water quality and chinook salmon would also be minimized by adherence to all permit conditions and by additional measures, which were previously detailed above in Section 6.5.5.

6.6.6 Effect Determination

Adult, sub-adult, and juvenile chinook salmon utilize the lower Snohomish River and the larger action area. Therefore, the project may affect the threatened Puget Sound chinook salmon. However, any chinook salmon present would experience negligible effects from the proposed dredging operations, as described in Section 6.6.3.

Conservation measures (as described in Section 6.6.5), including avoiding dredging during the migration period of juvenile chinook salmon, would prevent adverse short-term effects to chinook salmon during dredging operations. Dredging would result in temporary degradation of the water quality; these effects would be limited to the immediate dredging site and chinook salmon are believed to readily be able to avoid areas with temporarily degraded water quality conditions. The temporary loss of the benthic and forage fish communities in the dredging areas would have only a negligible effect on chinook salmon habitat, especially since juvenile chinook salmon forage mainly in intertidal areas outside of the navigation channel. In the unlikely event that chinook salmon would be present during dredging, they would be expected to readily avoid the project area during dredging operations.

For the reasons described in Section 5.4, no significant cumulative, interrelated or interdependent effects on Puget Sound chinook salmon are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

Overall, the effects of the proposed action on Puget Sound chinook salmon would be insignificant and discountable. Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** Puget Sound chinook salmon. Similarly, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect designated critical habitat** for Puget Sound chinook salmon.

7.0 ESSENTIAL FISH HABITAT

Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Act, which regulates fishing in US waters, to establish new requirements for “Essential Fish Habitat” (EFH) descriptions in federal Fishery Management Plans (FMPs) and to require federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that would adversely affect EFH (PSMFC 2000). The Pacific States Fishery Management Council amended the Pacific Groundfish Fishery Management Plan and the Coastal Pelagic Species Management Plan (1998a, 1998b) to designate waters and substrate necessary for spawning, breeding, feeding, and growth of commercially important fish species.

The marine extent of salmon, groundfish, and coastal pelagic EFH includes those waters from the nearshore and tidal submerged environments within Washington, Oregon, and California state territorial waters out to the exclusive economic zone (370.4 km) offshore between the Canadian border to the north and the Mexican border to the south.

There are seven composite EFH's: estuarine, rocky shelf, non-rocky shelf, canyon, continental shelf/basin, neritic and oceanic habitats. The Corps maintenance dredging occurs exclusively in soft substrate areas within the Snohomish River navigation channel with disposal options including open water disposal sites and beneficial use for capping similar soft sediment habitats with the estuarine composite EFH. Dredging and disposal operations could impact demersal fish species associated with the soft bottom of the river channel, and the top of the Marine Sediment Unit cap (such as skates, sanddab, soles, and flounders), as well as pelagic fish species that utilize the waters of the open water disposal sites (such as anchovy and Pacific sardine). Adult and juvenile chinook, coho, and pink salmon utilize the habitats of the estuarine composite EFH, as well as the pelagic waters over the disposal sites.

Dredging will temporarily reduce the populations of benthic organisms that are prey species for various groundfish and juvenile pelagic fishes that utilize estuarine composite EFH. Benthic and epibenthic prey species will be temporarily displaced, but are expected to recover shortly (within one year) after dredging activities are completed. Since new invertebrate communities will eventually be established in the dredging and disposal areas, no long-term loss of biological productivity is expected as a result of the dredging and disposal operations (see Section 5.3.2). Similarly, forage fish species such as anchovy, sardine, and squid could also be temporarily impacted by elevated turbidity levels or reduced dissolved oxygen levels near the operating dredge. However, no long-term loss of forage fish biological productivity is expected (see Section 5.3.3).

In order to conserve estuarine EFH and reduce potential effects on associated species, the proposed dredging and disposal operations would incorporate the following conservation measures:

- Employing a clamshell dredge to reduce potential entrainment of demersal species
- Providing supplemental information to NOAA Fisheries and USFWS detailing the method of dredging, as well as the location, elevation, volume, and placement specifics of any future proposal to hydraulically dredged in order to use dredged materials beneficially on Jetty Island or at any of the upland sites.
- Implementing the provisions of the WDOE Water Quality Certification and short-term Modification to the Water Quality Standards authorizations to reduce turbidity and limit reduction in dissolved oxygen during dredging operations.
- Employing a dredging window of October 16 to February 14 to minimize impacts to juvenile salmonids and limit the potential for bull trout to be migrating within the lower river during the dredging activities.
- Conducting maintenance dredging based on the results of site specific condition surveys conducted each year. These surveys determine the areas where the basins and channel need to be dredged and help limit both the dredging area and duration to that necessary to maintain safe navigation. This helps to maximize the time interval between dredging and allow the benthic community to recover between dredging cycles to the greatest extent practical.

- Utilizing established PSSDA open water disposal sites with known latitude-longitude coordinates enables agencies to track cumulative impacts at these sites through a GIS database.
- Testing the sediments prior to dredging and disposal to verify suitability for standards for disposal at the PSSDA site, as well as the Washington State Department of Ecology's Sediment Management Standards (SMS) and Atterberg Limits for use as capping material at the PSR Superfund site.
- Using the dredged sediments to cap the PSR Superfund site will ultimately reduce sediment contamination effects on demersal fish species and reduce uptake of toxins into the benthic and pelagic food chains within Puget Sound.

The Corps believes the combination of the conservation measures detailed above will reduce effects on Essential Fish Habitat to the point that the effects will be insignificant and discountable, and thus the proposed dredging and disposal operation **may affect, but is not likely to adversely affect** Essential Fish Habitat.

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CENWS-PM-PL-ER **13 November 2003**

MEMORANDUM FOR NAVIGATION SECTION (ATTN: Patricia Miller)

SUBJECT: Revisions to Project Description for Section 7 Consultation for the U.S. Army Corps of Engineers, Seattle District Maintenance Dredging of Snohomish River Navigation Channel, Downstream and Upstream Settling Basins, Everett, Washington.

The U.S. Army Corps of Engineers, Seattle District previously prepared a biological assessment (BA) dated September 29, 2003, as required by Section 7(a) of the Endangered Species Act of 1973 (16 U.S. C., 1531 et seq.) to address all federally listed species for the Snohomish River Navigational Channel dredging project at Everett, Snohomish County, Washington. That BA was transmitted to the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries (collectively referred to as the Services) on October 1, 2003.

Within that BA, we determined that the proposed dredging and disposal "may affect, but is not likely to adversely affect" listed species within the project area. We requested a finding of concurrence with our determinations for the requested period of the BA (fiscal year 2004 through 2008) on the Snohomish River Navigational Channel, Downstream and Upstream Settling Basins.

In the time since the BA was submitted to the Services, funding constraints have resulted in the need to postpone the proposed dredging cycle within the Snohomish River Navigation Channel. As a result of postponing the proposed dredging, the project description has changed from that described in the September 29, 2003 BA. These changes are detailed herein.

Period of Requested Concurrence:

- *Previously presented information*: request concurrence from the Services on effect determinations covering dredging activities proposed for fiscal years 2004 through 2008

- *Change requested*: request concurrence from the Services on effect determinations covering dredging activities proposed for fiscal years 2005 through 2009

- *Reason for Change*: dredging within Snohomish River Navigation Channel postponed one year due to reprioritization of funding to sites with awarded contracts and more immediate dredging needs

Order Dredging in the Settling Basins:

- *Previous presented information*: dredge downstream settling basin in fiscal year 2004, then upstream basin in fiscal year 2005, alternate years thereafter through fiscal year 2008

- *Change requested*: no dredging in fiscal year 2004; dredge downstream and upstream basins in fiscal year 2005, then dredge basins in alternate years thereafter through 2009; dredging and disposal activities would be repeated in fiscal years 2006 and 2008 in the downstream basin and in 2007 and 2009 in the upstream basin under this BA.

- *Reason for Change*: accumulated sediments need to be removed from both basins in fiscal year 2005 due to postponement of dredging by one year; this change also allows Corps to provide more material to the PSR Superfund site to potentially complete the cap of Marine Sediment Unit.

Predicted Volume of Material Dredged from the Settling Basins:

- *Previous presented information*: Based on a condition survey conducted in spring 2003, an approximate total of 276,494 cubic yards of sediment would have been dredged from the downstream settling basin and adjacent portion of the navigation channel in FY 2004. An approximate total of 200,900 cubic yards of sediment would have been dredged from the upstream settling basin and adjacent portion of the navigation channel in FY 2005.

- *Change requested*: Details from an annual condition survey conducted in the spring of calendar year 2004 would be used to determine the volume of material to be dredged from the downstream and upstream basins during fiscal year 2005. Therefore, it is not possible to exactly predict the volume of material that would need to be dredged during FY 2005 through 2009. Shoaling rates and depths depend on river flows and sedimentation rates that are driven by seasonal rainfall. However, the volume dredged during the FY 2005 through FY 2009 period would be conducted in the same manner, within the same time window, and with the same conservation measures as described in the September 29, 2003 BA. Total volumes dredged between FY 2005 and 2009 would not exceed the permitted maximum of 800,000 cubic yards from the downstream settling basin, 500,000 cubic yards from the upstream settling basin, and 200,000 cubic yards from the navigation channel, as presented in Public Notice CENWS-OD-TS-NS-22.

- *Reason for Change*: new condition survey will need to be conducted in the spring of calendar year 2004 (after winter river flows have subsided) to determine the volume and location of accumulated sediments that need to be removed from the settling basins.

Additional Information:

- As previously described in the September 29, 2003 BA, dredging within the downstream settling basin would be accomplished with a clamshell dredge. The majority of the sediment from the downstream basin would be disposed of by bottom-dump barge at the WDNR managed PSDDA open water site in Port Gardner, provided it passes all criteria for open water disposal. If the sediments were appropriate, a portion of the sediments from the downstream basin would also be used beneficially to cap the Marine Sediment Unit (MSU) of the PSR Superfund site in Elliott Bay. The sediments would be transported to the MSU site by bottom-dump barge.

- As previously described in the September 29, 2003 BA, dredging within the upstream settling basin would most likely also be accomplished with a clamshell dredge. These sediments would be used beneficially to cap the MSU site. It is currently anticipated that the MSU will need approximately 217,000 cubic yards of sediment to complete capping

of Remediation Areas (RA) 5a and RA5b. Depending on the results of the spring condition survey, much of this material could come from the upstream settling basin.

- As previously described in the September 29, 2003 BA, it is possible that sediments from the upstream settling basin and adjacent portion of the channel could be dredged via hydraulic pipeline dredge if they were appropriate and specifically needed for beneficial use at a nearby upland site. Hydraulic dredging allows for the direct placement of sediments at beneficial use sites located along the lower Snohomish River. Current estimates are that the Riverside Business Park site may need up to 150,000 cubic yards during fiscal year 2005; a portion of that volume could come from the upstream settling basin within the proposed period of dredging (fiscal years 2005 through 2009).

- As previously described in the September 29, 2003 BA, all dredging and disposal activities will still be performed between October 16 and February 14 of each fiscal year and will generally require approximately two to three weeks to complete. Disposal activities at the PSSDA open water site and the PSR Superfund site will be conducted in accordance with established criteria for these sites, as detailed in their respective Biological Assessments and concurrence letters, as referenced in the BA (USACE 2000a and 2000c, USFWS 2000, NMFS 2000, NMFS 2003a, USACE and EPA 2002, USFWS 2003, NMFS 2003b).

Based on this information, we believe that none of the changes outlined above alter our determination of "may affect, but is not likely to adversely affect" listed species within the project area. Therefore, we believe this letter and its attached information, coupled with the September 29, 2003 Biological Assessment contain sufficient information to assure a concurrence letter from your office.

If you have any questions regarding this information please contact Mr. George Hart at (206) 764-3641 or Ms. Torrey Luiting at (206) 764-4476.

Amendment of Biological Assessment for Proposed Action Area FY 2005-2009 Maintenance Dredging of the Snohomish River Navigation Channel, Upstream and Downstream Settling Basins, Everett Washington

SUBJECT: Revisions to Disposal Sites for Section 7 Consultation for the U.S. Army Corps of Engineers, Seattle District Maintenance Dredging of Snohomish River Navigation Channel, Downstream and Upstream Settling Basins, Everett, Washington.

The specific location, description, proposed actions and potential effects of those actions on listed species for the Riverside Business Park site are detailed in the document below. Please refer to the September 2003 BA (Corps 2003) for species and habitat information relevant to the lower Snohomish River, as that information is generally not repeated herein, except as it relates to the lower Snohomish River and its riverbanks in the vicinity of the Riverside site.

1.0 PROJECT LOCATION

1.1 Location of Riverside Business Park site:

The Port of Everett Riverside Business Park site is located downstream from the upstream settling basin, just south of the State Route 529 bridge along the left bank of the Snohomish River, and east of East Marine View Drive (Figure 1). The entire Riverside Business Park site encompasses approximately 78 acres and is predominately undeveloped land. The portion of the site designated to receive the dredged sediments, the dredged material site or 'cell', encompasses approximately 8 acres of the property and is located at the property's extreme southern end to the west of Ferry Baker Island (Figures 1 and 2).

2.0 DESCRIPTION OF PROJECT AREA AND ACTION AREA

2.1 Existing Conditions at the Riverside Business Park Site:

The far southern end of the 78-acre site has been used for placement of dredged sediment destined for beneficial use on the Riverside or other comparable upland sites (Figure 2, Photo 1). The Riverside site was formerly the Weyerhaeuser Everett East lumber processing site; prior to purchase of this site by the Port of Everett, approximately 300,000 cubic yards of wood waste debris was removed from the site by Weyerhaeuser in an agreement with the Washington Department of Ecology to cleanup contaminates at the site. Since remediation of the site, the Port has been importing clean sediment to refill the site and to ultimately allow redevelopment of the site (as well as others in the vicinity). Material was last placed on the Riverside site by hydraulic pipeline dredge in

January 2002; at that time, the upstream settling basin provided approximately 111,129 cubic yards of sediment to the Riverside site.

The Riverside site is a generally flat, undeveloped site. It is characterized on its extreme northern end by low herbaceous vegetation (Photo 7). The dredged material 'cell' at the southern end of the site is completely devoid of vegetation, being composed of sands previously deposited on the site in past rounds of maintenance dredging (Photo 1). The eastern edge of the property slopes down to the river and supports a fringe of riparian vegetation, predominately young trees and invasive shrubs.

3.0 DESCRIPTION OF PROPOSED ACTIONS

3.1 Proposed FY 2005 dredging of Upstream Settling Basin and adjacent portion of channel:

The upstream settling basin and a portion of the navigation channel just upstream of the upstream basin (Figure 1) would also be dredged in FY 2005 (between 16 October 2004 and 14 February 2005). These areas would be dredged by hydraulic pipeline dredge that allows for direct placement of the dredged material onto uplands within an approximately one-mile radius of the dredging location. The dredged material would be beneficially used for redevelopment of the Riverside Business Park site by directly placing the sediment onto the site. Clamshell dredging would be used to remove any available sediment not needed at the Riverside site and place it on a bottom-dump barge for transport to the PSR Superfund or the PSSDA open water disposal sites.

The upstream settling basin would be dredged between stations 68+00 and 88+00 to an authorized depth of up to –40 feet MLLW, with an allowable over-depth of two feet below the required dredge depth (i.e. to –42 feet MLLW) (Figure 1). This area encompasses approximately 3,500 linear feet of channel (Figure 1). The portion of the channel just upstream of the upstream settling basin would also be dredged between stations 53+00 to 68+00 to a required depth of –8 feet MLLW, with an allowable over-depth of two feet below the required dredge depth (i.e. to –10 feet MLLW). Side slopes along the left bank edge of the dredged channel would be approximately 1:3 slopes (vertical:horizontal) after dredging; side slopes along the right bank edge would be approximately 1:6 (vertical:horizontal) after dredging. The total estimated volume available from the upstream settling basin and adjacent portion of the channel is approximately 200,000 cubic yards of sediment based on condition surveys conducted in spring of calendar year 2003.

The existing intertidal area with variable widths between 50 and 150 feet wide would be retained along both banks of the upstream settling basin and navigation channel in this area during and after dredging. This area extends between the outer edge of the dredged channel and the shoreline of the Kimberly Clark Log Yard property to the west and the shoreline of the Everett Sewage Treatment facilities to the east of the outer edge of the navigation channel and settling basin. Because only developed shoals would be dredged

within the settling basin, dredging may not occur to the extreme outer edge of the basin based on the shoals indicated on the condition survey.

3.2 Proposed FY 2005 disposal at the Riverside Business Park site:
Sediment hydraulically dredged from the upstream settling basin and adjacent portion of the channel in fiscal year 2005 would be directly placed onto the 8-acre southern portion of the Riverside Business park site (Photo 1). The sediments would subsequently be 'rehandled' (collected and moved by truck) by the Port of Everett for use at the Riverside site or at other regional sites in need of dredged sediment.

In FY 2005, up to approximately 150,000 of the 200,000 cubic yards of sediment available from hydraulic dredging of the upstream settling basin and adjacent portion of the channel would be directly placed onto the Riverside Business Park site for beneficial use. Sediment not needed at the Riverside site would be dredged by clamshell and either used at the PSR Superfund site or disposed of at the PSSDA open water site, as previously described in the September BA (Corps 2003) and November 2003 amendment letter.

Sediment would be transferred to the site through the hydraulic pipeline which extends from the upper settling basin along the left bank river channel and then up and over the existing salt marsh and riparian berm and onto the Riverside site (Photos 2 through 5). During past sediment placements at the Riverside site in January 2002, the 22-inch diameter plastic pipeline (Photo 2) was towed to the site during high tide. Extra flotation on the pipe at high tide allows the contractor to get the pipe near the landing area where a strap around the pipe is attached to a cable that is pulled by a dozer (to snake the pipeline) into the disposal area. The pipeline is pulled up onto and over the intertidal marsh bench by the equipment parked on the upland berm.

Location and placement of the pipeline would be conducted in a manner similar to the previously permitted sediment placement at the Riverside site. Great care would be taken during placement of the pipeline to minimize impacts to existing intertidal salt marsh and riparian vegetation along the shoreline to the greatest extent feasible. The salt marsh plants will be in winter dormancy during the approximately three to four week time period when the pipeline will be resting on the marsh and the pipeline does not move once in place (Photo 4). Due to these factors, there are not expected to be any long-term impacts to the area of intertidal marsh affected by the temporary placement of the pipeline.

The dredged material 'cell' is separated from the riparian edge of the river by man-made berms of sand created to contain the water/sediment slurry (Photo 5). The cell is completely devoid of vegetation and slopes gradually downward to the north to slowly move the water toward the return point as the sediment settles out. Once the sediment settles out of the water/sediment slurry, the water would be returned to the river through a system of metal weirs extending from the end of the dredged material cell through a previously disturbed portion of the riparian edge to the river channel (Photo 6).

Water quality monitoring of the return water by the Corps would ensure State water quality conditions for suspended solids and dissolved oxygen are met within the appropriate mixing zone of 150 foot radius from point of water discharge.

3.3 Conservation Measures:

Measures incorporated into the proposed action, including the dredging scheduling and Section 401 Water Quality Certification conditions, would reduce adverse environmental effects. The proposed dredging would be conducted between October 16 and February 14 of each fiscal year. Dredging would thus be avoided during peak bull trout and juvenile salmon migration months between February 15 and July 15 (or as designated by NOAA Fisheries, USFWS, or WDFW). This timing would also avoid noise impacts to juvenile salmonids. Avoiding dredging during peak salmonid out-migration periods would also minimize the short-term effects of the proposed action on the variety of species that prey upon juvenile salmonids.

The principal water quality impact of dredging is the temporary increase in concentration of suspended solids in waters near the dredging site. The effects of dredging on water quality can occur during dredging, during transfer of the dredged material to the barge, or during decant water discharge or if the barge overflows. For placement at the Riverside Business Park site, dredging would be accomplished by using a hydraulic pipeline dredge. Sediments would be resuspended into the water column by the cutterhead/water jets of the hydraulic dredge; the cutterhead is used to break up the sediment surface prior to suctioning through the plastic pipe that allows for direct placement at the designated upland site.

These effects are temporary and localized to the immediate area surrounding the dredging. Due to the timing of the proposed dredging operation, they are limited in time to periods outside the migration period for juvenile salmonids and are limited in space to the immediate vicinity of dredging activities. Temporary effects on water quality and on juvenile salmonids would also be minimized by adherence to the Section 401 Water Quality Certification conditions issued by the Washington State Department of Ecology (WDOE) for this project. Impacts from the placement of dredged materials on the Riverside Business Park site would be minimized through directed discharge points and sampling of the return water for total suspended solids and dissolved oxygen.

4.0 SPECIES AND HABITAT INFORMATION

4.1 Listed Species

Based on species lists provided by USFWS for previous rounds of maintenance dredging and the NOAA Fisheries website, the following species under the jurisdiction of USFWS and NOAA Fisheries are addressed in this BA:

Table 1: Species addressed in September 2003 Biological Assessment for this project.

Common Name	***Scientific Name***	**Federal Listing Status**	**Has Critical Habitat Been Designated?**
Bald Eagle	*Haliaeetus leucocephalus*	Threatened – July 12, 1995 Delisting proposed - July 6, 1999	No
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened – October 1, 1992	Yes, designated on May 24, 1996
Steller Sea Lion	*Eumetopias jubatus*	Threatened – November 26, 1990	No
Puget Sound/Coastal Bull Trout	*Salvelinus confluentus*	Threatened – November 1, 1999	No
Puget Sound chinook salmon	*Oncorhynchus tshawytscha*	Threatened – March 24, 1999	Yes, designated on February 16, 2000

Other Federally listed threatened or endangered species that may occur in Puget Sound include the humpback whale (*Megaptera novaengliae*; endangered) and leatherback sea turtle (*Dermochelys coriacea*; endangered). However, these species are extremely unlikely to occur within the lower Snohomish River, Port Gardner Bay, Jetty Island, or Elliott Bay (i.e. within the action area as defined in Section 1.3 of the September 2003 BA) based on extremely infrequent historic occurrences and a lack of typically utilized and appropriate habitat within the action area. These two species are therefore not specifically evaluated in this BA as the proposed dredging and disposal activities would have *no effect* on these two species.

4.2 Biological Habitat Quality

Only species and habitats relative to the dredging the upstream settling basin and disposal at the Riverside site are specifically described below; please refer to the September 2003 BA (Corps 2003) for additional details regarding species and habitat quality within the larger action area.

4.2.1 Benthic and Epibenthic Prey Availability

While the intertidal habitats of Jetty Island have been studied and documented over the past five years (as detailed in the September 2003 BA), benthic assemblages within the deeper and unvegetated portions of the settling basins and dredged portions of the

navigation channel are not well documented, although are expected to be of much lower biodiversity than those of the adjacent intertidal marshes and mudflats due to their depth and regular accumulation of fine sediments. The density and diversity of invertebrate assemblages within and around Jetty Island, as well as within the larger Snohomish River estuary is also evidenced by the migratory and year-round use of the area by foraging shorebirds. Because of their occurrence at deeper depths, the assemblages within the center of the settling basins and navigation channel are of lower functional value to juvenile salmonids.

4.2.2 Forage Fish Availability

Forage fish include Pacific herring, surf smelt, and sand lance larvae and juveniles prey on epibenthic invertebrates and crustaceans and are themselves important prey items for larger juvenile salmon and bull trout. Sand lance is particularly important for juvenile chinook and bull trout. Both juvenile surf smelt and sand lance have been captured by Pentec during seining within the lagoon formed by the berm on Jetty Island (Pentec 1996) and are abundant in the shallow waters of the Snohomish River estuary and the nearshore marine waters of Possession Sound and Port Gardner Bay. However, none of these forage fish species spawn within the lower Snohomish River due to the modified shoreline and lack of intertidal gravel and sandy beaches (WDFW PHS database search, August 22, 2003).

4.2.3 Subtidal and Intertidal Vegetation

Scattered areas of intertidal salt marsh fringe the lower riverbanks around the Riverside Business Park site, particularly between the western shoreline of the Riverside site and Ferry Baker Island to the east. Dominant species in this area include cattails, rushes, and sedges (Pentec 2004). Dominant intertidal salt marsh vegetation along the western shoreline of the river includes a narrow strip of mudflat and an approximately 75- to 100-foot wide low salt marsh bench of predominately native species including Lyngby's sedge (*Carex lyngbyei*), silverweed (*Potentilla anserina*) and baltic rush (*Juncus balticus*), and seaside arrowgrass (*Triglochin maritimum*).

4.2.4 Riparian and Wetland Vegetation

Riparian vegetation is limited on the Riverside site to a narrow strip of young trees and shrubs along the edge of the site, waterward of the berm that contains the water/sediment slurry. This area is dominated by red alder (*Alnus rubra*) with a largely invasive understory of Himalayan blackberries (*Rubus discolor*) and Scot's broom (*Cytisus scoparius*).

There are no wetlands located within the dredged material cell of the Riverside site. Two wetlands are located along the western edge of the southern portion of the site (Wetlands A and B), one wetland is located along the eastern edge of the site adjacent to the river (Wetland C), and one wetland is located off of the southern boundary of the site (Wetland D) (Figure 3). Wetland A is a very small (approximately 128 square feet) isolated topographic depression dominated by largely invasive emergent vegetation (Talasaea

Consultants 1998). Wetland B is largely located offsite, but approximately 518 square feet extend onto the Riverside property. Wetland B is a palustrine emergent and scrub-shrub wetland associated with a drainage ditch (Talasaea Consultants 1998) and is separated from the dredged material cell by the sand berm that contains the water/sediment slurry. Wetland C is the intertidal salt marsh bench that extends along the shoreline of the site and is dominated by Lyngby's sedge, hardstem bulrush (*Scirpus acutus*), silverweed, baltic rush, and seaside arrowgrass. Wetland D is located off-site to the south on property owned by the City of Everett. The wetland consists primarily of emergent vegetation interspersed with scrub-shrub vegetation (Talasaea Consultants 1998).

4.2.5 Upland Vegetation

For the majority of the Riverside site, the upland plant communities are restricted to mowed herbaceous fields interspersed with compacted bare ground (Port of Everett 1999). There is no vegetation in the dredged material cell on the southern portion of the site. The highest elevations of Jetty Island support upland species including bighead sedge (*Carex macrocephala*) and beach peavine (*Lathyrus japonicus*), as well as trees and shrubs including black cottonwood and invasive shrubs such as Scot's broom and Himalayan blackberry.

5.0 EFFECTS OF THE ACTION

Effect determinations were based on predicting changes from the baseline condition of the indicator-based categories of habitat function described in Section 3.0 of the September 2003 BA (Corps 2003). That evaluation was generally qualitative in nature and was divided into effects on the water quality, physical habitat quality, and biologic habitat quality pathways, followed by a synopsis of potential interrelated, interdependent, and cumulative effects. Only effects of the dredging the upstream settling basin and disposal at the Riverside site are specifically described below; please refer to the September 2003 BA for additional details. Effect determinations for bald eagle, marbled murrelet, Steller sea lion, bull trout, and Puget Sound chinook salmon (Section 6.0) as specifically related to the upstream settling basin and Riverside Business Park site conclude this document.

5.1 Water Contamination

The sediments of the settling basins and adjacent portions of the navigation channel are considered 'low-moderate' ranked for contaminates. PSSDA protocol sediment suitability testing determined on January 28, 2004 that sediments from the downstream settling basin and channel are appropriate for open water disposal at the Port Gardner PSSDA site; a suitability determination on sediments from the upstream basin is in process. Based on past rounds of suitability testing, the sediments in the upstream settling basin are expected to be suitable for open water disposal at the PSSDA site and for beneficial use at the Riverside site. The sediment characterizations collected in calendar

year 2004 have a 'recency frequency' of five to seven years; contaminate testing will thus be required again in 2009 to 2011 prior to dredging.

The Washington Department of Ecology (WDOE) regulates water quality through a project specific Water Quality Certification and short-term Modification to the Water Quality Standards authorizations, if necessary to accommodate 'essential' activities. Based on previous rounds of maintenance dredging and similar maintenance dredging of the Duwamish River, the Corps anticipates that the proposed dredging for FY 2005 through 2009 will be granted a WDOE Water Quality Certification with accompanying conditions to reduce impacts to water quality. The Corps also anticipates that a 'Modification to the Water Quality Standards' will also been granted. Past modifications have specified the following criteria to accommodate temporary impacts on water quality: a mixing zone of 300 feet radially and 600 feet down current from the dredging operation, waived Class A turbidity standards, and no reduction in dissolved oxygen below 4.0 mg/l. Typical corrective measures (in case water quality parameters exceed established standards) stipulated in the WDOE Water Quality Certification include: (1) modifying the dredging activity or equipment; (2) reducing the dredging rate; or (3) stopping dredging operations. These corrective measures would apply until dredging operations demonstrated compliance with water quality standards. Compliance with WDOE Water Quality Certification standards is expected to minimize water quality impacts during dredging to levels that will not degrade water quality conditions within the action area.

Because of the testing regime and anticipated permitting conditions described above, no contamination of the water column as a result of the dredging or subsequent disposal is expected. Therefore, temporary impacts to water quality during dredging are expected to be insignificant and discountable and are not expected to significantly degrade the existing water quality condition through water contamination within the action area or have adverse effects on listed species (as detailed in the September 2003 BA, Corps 2003).

5.2 Turbidity and River Flow

Temporary increases in turbidity are expected during active dredging of the settling basins and the channel (whether by clamshell or hydraulic pipeline dredge). More limited turbidity is expected once the hydraulically dredged sediments have settled out on an upland disposal site and the overflow water reenters the river. During dredging and disposal, suspended sediment concentrations vary throughout the water column, with larger sediment plumes typically occurring at the river bottom closer to the contact point of the dredge. Concentrations typically then decrease exponentially moving away from the dredging site both vertically within the water column and horizontally across the bottom and decrease with the movement of the river current and tides.

Such increases in turbidity could affect juvenile salmonids in the immediate vicinity of the active dredging operation. The primary determinate of risk level for a particular species is likely to lie in the spatial and temporal overlap between the area of elevated

turbidity, the degree of turbidity elevation, the occurrence of the fish, and the other habitat options available to the fish for carrying out the critical function of their particular life-history stage (Nightingale and Simenstad 2001).

However, areas of increased turbidity over background levels are expected to last only for a short duration during the dredging operations. Any early migrating juvenile or adults transiting through the upstream settling basin or within the vicinity of the Riverside Business Park site could hold along the shoreline or move up into Union or Steamboat sloughs until the temporary turbidity dissipates.

While turbidity would be elevated on a temporary and localized basis by dredging, total suspended sediment levels sufficient to cause adverse effects would be very limited in extent and duration. However, in order to further reduce potential negative effects of turbidity on juvenile salmonids, even of limited duration, dredging operations would be timed between October 16 and February 14 specifically to avoid juvenile out-migration periods. This timing will dramatically reduce the temporal overlap between anticipated increases in turbidity during dredging and disposal and the presence of juvenile salmonids within the lower Snohomish River. This will consequently reduce the potential for exposure of juveniles to harmful levels of turbidity to a negligible level. In addition, the proposed dredging would occur when background levels of turbidity are naturally higher due to high winter levels of precipitation and runoff; this further reduces the proportional effect of any temporary increases in turbidity. Water being returned to the river following sediment settling at the Riverside site would also be monitored for turbidity and dissolved oxygen to reduce potential water quality impacts.

Therefore, temporary increases in turbidity during dredging and disposal activities are expected to be insignificant and discountable and are not expected to result in long-term degradation of the existing water quality condition through increased turbidity within the action area or to have adverse effects on listed species (as detailed in the September 2003 BA, Corps 2003).

5.3 Dissolved Oxygen

Dissolved oxygen concentrations tend to decline in the vicinity of dredging and disposal operations when the suspension of anoxic sediments creates high chemical oxygen demand. Temporary decreases in dissolved oxygen associated with increased suspended sediments are possible in the immediate dredging area, whether clamshell or hydraulic dredging is used, but are generally believed to remain close to ambient levels (which are elevated at this time of year) to last from several minutes to a half an hour.

Short-term, temporary effects on fish as a result of decreases in dissolved oxygen include avoidance of the dredging area and reduced foraging during and immediately after dredging as fish avoid areas of temporarily depressed dissolved oxygen. Adult fish are expected to avoid any localized areas of significantly depressed dissolved oxygen and utilize the adjacent, non-dredged intertidal areas for refuge during operation of the dredge. Juvenile salmonids will not be exposed to reduced dissolved oxygen conditions due to the timing of dredging between October 16 and February 14, outside of their

migratory window. Potential impacts due to reductions in dissolved oxygen levels as a result of dredging and disposal operations are thus expected to be highly localized and temporary.

Per Section 2.3, Conservation Measures, of the September BA (Corps 2003), temporary effects on water quality and on juvenile salmonids would also be minimized by: minimizing spillage of excess sediments from the clamshell bucket, minimizing spillage of dredged sediments by not filling disposal barges beyond their capacity, minimizing entrainment of fish and disturbance of the sediment surface outside of the immediate vicinity of the hydraulic dredging operations, and by using directed discharge points and sampling of the water returned to the river following hydraulic placement of the sediments on upland sites. Compliance with all PSSDA and 401 Water Quality permit conditions would also reduce potential effects of turbidity and resuspension of anoxic sediments.

Therefore, temporary decreases in dissolved oxygen during dredging are expected to be insignificant and discountable and are not expected to result in long-term degradation of the existing water quality condition through decreased dissolved oxygen within the action area or to have adverse effects on listed species (as detailed in the September 2003 BA, Corps 2003).

5.4 Temperature

The proposed maintenance dredging is not expected to significantly alter the depth or extent of the salt wedge within the lower Snohomish River. The resulting configuration of the bottom will not significantly change currents or flow pathways within the navigation channel from their historic condition since the 1910 authorization of maintenance dredging of the navigation channel. Dredging will remove areas of shoaled sediments and will return the settling basins and portions of the navigation channel to their authorized depths. The dredging will similarly have no effect on the distribution or density of riparian vegetation fringing (and shading) the river. Disposal operations at the Riverside site will likewise have no effect on shading of the river due to the elevation of the site and distance from shore; thus, disposal operations will not affect the temperature of the receiving waters.

Therefore, the proposed dredging is not expected to result in a change to water temperature in the action area or to affect listed species that may be sensitive to changes in water temperature (as detailed in the September 2003 BA, Corps 2003).

5.5 Sediment Contamination

The regular testing of sediments within the proposed dredging area ensures that any contaminated sediments are identified prior to dredging. This testing thus minimizes the potential resuspension or transport of contaminated sediments to other areas by preventing contaminated sediments from being disturbed during dredging. Sediments from the proposed downstream dredging areas are considered to be ‘low to moderate

ranked' for contaminates and have been consistently suitable for both beneficial uses and open water disposal since the most recent sediment characterization in 1996.

PSSDA protocol sediment suitability testing determined on January 28, 2004 that sediments from the downstream settling basin and channel are appropriate for open water disposal at the Port Gardner PSSDA site; a suitability determination on sediments from the upstream basin is in process. Based on past experience with the upstream basin sediments, they are expected to be suitable for open water disposal at the PSSDA site and beneficial use at the Riverside site.

The proposed maintenance dredging is thus not expected to change the degree or nature of sediment contamination within the action area or to have an adverse effect on listed species (as detailed in the September 2003 BA, Corps 2003).

5.6 Subtidal and Intertidal Vegetation

Because dredging activities are concentrated in the center of the navigation channel and settling basins that support only subtidal habitats, the proposed dredging will not directly impact any intertidal marsh areas within the lower Snohomish River. Dredging of the navigation channel and the upstream settling basin will not affect the existing extent or condition of intertidal marshes or shoreline vegetation in this area. The existing intertidal area along both banks of the upstream settling basin and navigation channel has variable widths between 50 and 150 feet wide; this area would be retained during and after dredging. By maintaining the navigatable depth of the waterway, the proposed dredging will help prevent vessels from stranding on existing intertidal marshes along the navigation channel. Vessel stranding and salvage has the potential to cause catastrophic disturbance to salt marshes.

Placement of the plastic pipeline is not expected to significantly or permanently damage the intertidal saltmarsh bench. Floating the pipeline into place and then pulling the pipeline across the bench with equipment parked in the upland is expected to minimize disruption to the marsh surface. During past placements, it was not necessary to drive or park track or rubber tire equipment on the marsh. Setting the hydraulic pipeline onto the intertidal salt marsh along the southern end of the Riverside Business Park site would temporarily cover the portion of the marsh beneath the pipeline (Photo 4). Because the marsh vegetation will be dormant during the proposed dredging and disposal period (October 16 to February 14) and the pipeline will be in place for only three to four weeks during that time period, the impacts from this temporary placement are not expected to reduce the ability of the salt marsh to resprout in the spring following the dredging activities.

Therefore, any changes to the distribution, character, or abundance of subtidal and intertidal vegetation as a result of dredging and disposal activities are expected to be insignificant and discountable and are not expected to result in long-term degradation of these communities within the action area or to have adverse effects on listed species (as detailed in the September 2003 BA, Corps 2003).

5.7 Wetland and Riparian Vegetation

Because dredging activities are concentrated in the center of the navigation channel and settling basins that support only subtidal habitats, dredging will not impact the riparian trees and shrubs which fringe portions of the lower Snohomish River.

None of the wetlands located on the Riverside site will be filled by placement of the dredged sediments within the dredge material cell on the southern portion of the site. The hydraulic pipeline will not disturb Wetlands A, B, or D as they are completely separated from the dredged material cell by the sand berm (Figure 3, Photos 3 and 5). A small portion of Wetland C (the intertidal marsh) and the riparian vegetation along the shoreline will be temporarily disturbed by the placement and presence of the hydraulic pipeline (Photo 4). However, these impacts will occur for a short period of time during the dormant season for the plants and will be confined to the immediate area under and around the pipeline. No long-term change in the species diversity, plant density, or character of these wetland and riparian areas is expected once the pipeline is removed at the end of the sediment placement into the dredged material cell.

Therefore, any changes to the distribution, character, or abundance of wetland and riparian vegetation as a result of dredging and disposal activities are expected to be insignificant and discountable and are not expected to result in long-term degradation of these communities within the action area or to have adverse effects on listed species (as detailed in the September 2003 BA, Corps 2003).

5.8 Upland Vegetation

There will be no disturbance to upland vegetation surrounding the navigation channel of the upstream or downstream settling basins. No disturbance is expected to upland vegetation on the southern portion of the Riverside site as the dredged material cell is completely unvegetated and the placement of the hydraulic pipeline would not impact any other portions of the site.

Therefore, any changes to the distribution, character, or abundance of upland vegetation as a result of dredging and disposal activities are expected to be insignificant and discountable and are not expected to result in long-term degradation of upland communities within the action area or to have adverse effects on listed species (as detailed in the September 2003 BA, Corps 2003).

5.9 Aquatic Invertebrates

Dredging will temporarily reduce the populations of the benthic and epibenthic invertebrate community through removal of the benthic substrate and smothering as suspended sediments settle out of the water column. Invertebrate prey for juvenile salmonids and bottom fish will thus be temporarily reduced along the center-line of the dredged portions of the navigation channel and within the upstream and downstream settling basins. Total organic carbon could be slightly lower in the newly exposed

sediments after dredging. Thus, the amount of food (in the form of organic matter) available for benthic invertebrates in these areas would be slightly reduced on a temporary basis.

While benthic and epibenthic prey species will be temporarily displaced, populations are expected to recover shortly (within one year) after dredging activities are completed. Because the dredging will occur only in a portion of the navigation channel and within the settling basins, adjacent undisturbed intertidal habitat along the edges of the dredged areas will continue to provide an established source of benthic and epibenthic invertebrates to colonize the newly disturbed subtidal substrate. Since new invertebrate communities will recolonize the dredging area, no long-term loss of biological productivity or prey base for juvenile salmonids or bottom fish is expected.

No impact to invertebrate communities is expected due to disposal of the dredged sediments at the Riverside site as the site is upland and is devoid of vegetation. As such, it does not contribute to the benthic invertebrate food web that supports juvenile salmonids.

Therefore, although there will be temporary decreases in benthic and epibenthic prey within the dredging area, this decrease is expected to cause an insignificant and discountable effect on local invertebrate populations in the action area and are not expected have adverse effects on listed fish species or adverse food web effects (as detailed in the September 2003 BA, Corps 2003).

5.10 Anadromous Salmonids

Both a hydraulic pipeline dredge and a clamshell dredge would be used to remove sediments from the upper settling basin and navigation channel. It is generally accepted that clamshell buckets do not have the potential to entrain fish because the bucket is totally open during its descent and thus cannot trap or contain a mobile organism during its descent through the water column. Due to the understanding of the operation of the clamshell, no specific studies of entrainment of fish have been conducted on this type of equipment.

In contrast, due to the recognized potential for hydraulic dredges to entrain fish, the hydraulic dredge has been studied extensively. Typically, hydraulic dredges have been found to entrain few or no salmonids or other mobile fishes (McGraw and Armstrong 1988, Larson and Moehl 1988, Larson and Cassidy 1990, Kyte and Houghton 1994 [unpublished data], Reine et al. 1998). Based on the operation of the clamshell dredge bucket, and the ability of salmonids and other mobile fishes to avoid entrainment in hydraulic dredges, the proposed dredging is not likely to entrain juvenile, sub-adult, or adult salmonids or other mobile fishes.

The temporary increases in noise, turbidity, and water column disturbance during the dredging is expected to signal adult fish to avoid the area during dredging activities. Because the dredging is confined to the center of the navigation channel, adults can

readily avoid the disturbed portion of the water column by moving toward the shoreline and either holding or transiting around the area being dredged. The proposed dredging is not likely to adversely affect adult salmonids if their upstream migration overlaps the dredging period. The proposed dredging and disposal activities have been timed so that few juvenile salmonids are expected to migrating through the waterway or using the adjacent shoreline habitats. If any early migrants are moving through the area during the period of dredging, they are likely to remain near the shoreline, thereby avoiding the disturbances associated with dredging in the main navigation channel.

Therefore, although there will be temporary increases in noise and disturbance, coupled with temporary decreases in water quality surrounding the dredging and disposal operations, these are expected to be insignificant and discountable effects on local fish populations in the action area and are not expected to have adverse effects on listed fish species (as detailed in the September 2003 BA, Corps 2003).

5.11 Forage Fish

Temporary effects on the forage fish community are possible during dredging and disposal activities. Forage fish such as Pacific herring and surf smelt are expected to avoid the dredging area, resulting in a temporary loss of forage fish from the immediate area during the dredging period. Sandlance could be entrained in the sediment 'bites' of the clamshell bucket or by the suction action of the hydraulic dredge during daytime dredging, but they are unlikely to be affected by dredge 'bites' that occur at night since these fish diurnally burrow into higher elevation beaches at night.

Dredging and disposal activities are not expected to effect the spawning of Pacific herring, surf smelt, or sand lance because there is no appropriate spawning habitat within the vicinity of the dredging or disposal activities at the Riverside site. Forage fish are expected to immediately return to their usual foraging areas and behaviors after the dredging and disposal activities stop.

Therefore, although there will be temporary disturbance to forage fish populations, coupled with temporary decreases in water quality surrounding the dredging and disposal operations, these are expected to be insignificant and discountable effects on local forage fish populations in the action area and are not expected have adverse effects on listed fish species through food web interactions (as detailed in the September 2003 BA, Corps 2003).

6.0 EFFECT DETERMINATIONS

6.1 Summary of Effect Determinations

Common Name	***Scientific Name***	***Effect on Listed Species***	***Effect on Designated Critical Habitat***
Bald Eagle	*Haliaeetus leucocephalus*	May affect, but is **not likely to adversely affect**	No critical habitat is designated
Marbled Murrelet	*Brachyramphus marmoratus*	May affect, but is **not likely to adversely affect**	**No effect** on designated critical habitat
Steller Sea Lion	*Eumetopias jubatus*	May affect, but is **not likely to adversely affect**	No critical habitat is designated
Puget Sound/Coastal Bull Trout	*Salvelinus confluentus*	May affect, but is **not likely to adversely affect**	No critical habitat is designated
Puget Sound Chinook Salmon	*Oncorhynchus tshawytscha*	May affect, but is **not likely to adversely affect**	May affect, but is **not likely to adversely affect**

6.2 Bald Eagle

6.2.1 Occurrence in Project Area

Bald eagles are commonly seen flying over Possession Sound and are frequently seen perching and foraging along the lower Snohomish River. Several bald eagle nests occur within three miles of the downstream settling basin and Jetty Island and within four miles of the upstream settling basin and the Riverside Business Park site (as detailed in Section 6.2.2 of the September 2003 BA, Corps 2003).

6.2.2 Analysis of Effects

Potential effects of the proposed maintenance dredging on bald eagles include disturbance from the dredging and disposal activities and increased turbidity around navigation channel and the settling basins during dredging that may inhibit foraging or result in temporarily reduced food availability. Noise (running heavy equipment) and temporary increases in turbidity during dredging and disposal will likely cause prey fish and waterfowl to avoid the immediate area of the dredging and disposal operations.

Consequently, resident or wintering bald eagles are expected to temporarily avoid the immediate area and forage elsewhere until dredging operations are completed.

Because the action area represents a small portion of the foraging habitat locally available for bald eagles along the shoreline of central Puget Sound, any such interference with bald eagle foraging activity is expected to be insignificant and discountable, ending when the dredging and disposal activities are completed. Similarly, because resident and wintering bald eagle populations in this area are likely acclimated to frequent boat traffic on the lower Snohomish River no long-term effects on habitat suitability or bald eagle foraging behavior are expected. Noise and activity levels during the dredging and disposal activities are expected to be within the range of recurrent ambient levels within these industrialized areas.

Although dredging and disposal activities could take place during early portion of the nesting season (January through February 14), survival and reproductive success of bald eagles at the nests closest to the dredging areas will be unaffected due to their distance from the dredging area and the disposal area at the Riverside site (greater than two miles). Nesting bald eagles in these areas have repeatedly nested and fledged young from these highly industrialized and frequently disturbed shorelines. Thus, these birds are likely fairly acclimated to the passage of dredges and barges, and to frequent, temporary increases in noise levels.

Long-term degradation of bald eagle habitat is also not expected. Bald eagle prey availability should also not be substantially affected while the benthic community reestablishes along the dredge channel and within the disposal areas. For the reasons described in Section 5.4 of the September 2003 BA (Corps 2003), no significant cumulative, interrelated or interdependent effects on the bald eagle are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

6.2.3 Take Analysis

Although foraging activities of bald eagles may be temporarily disturbed during dredging and disposal operations, this disturbance is not expected to significantly disrupt normal behavior patterns sufficiently to create the likelihood of injury or ‘take’ of any bald eagles. Therefore, the potential for incidental take in any form (including harassment) is considered negligible.

6.2.4 Conservation Measures

No specific conservation measures are warranted, because the potential for adverse effects on the bald eagle from short-term dredging and disposal operations is negligible. Conservation measures described in Section 6.5.5 for bull trout and Section 6.6.5 for chinook salmon (as described in Section 5.4 of the September 2003 BA, Corps 2003) are expected to also benefit bald eagles by limiting effects on their salmonid prey.

6.2.5 Effect Determination

Proposed maintenance dredging and disposal activities at the Riverside site will not result in any long-term degradation of habitat or other significant adverse effects on bald eagles. Short-term effects such as noise disturbance and reduced prey availability will not occur or will be very small in magnitude, as discussed above. Temporary disturbance to foraging activities are expected to be insignificant and discountable. The survival or reproductive success of bald eagles in the project vicinity would not be affected.

Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** the bald eagle.

6.3 Marbled Murrelet

6.3.1 Occurrence in Project Area

The marbled murrelet is a permanent, though not common resident of southern Puget Sound in the vicinity of the open water disposal sites and the lower Snohomish River. In the Pacific Northwest, it forages almost exclusively in the nearshore marine environment (mainly within a few miles of shore), but nests in old growth forests as much as 50 miles from marine waters. Marbled murrelet nests do not occur within the action area, but murrelets may forage within the waters of Possession Sound, particularly during the winter.

Marine observations of murrelets during the nesting season are believed to correspond to the presence of large blocks of suitable nesting habitat inland. There are no suitable nesting areas within the vicinity of the lower Snohomish River or the Riverside site. Similarly, no designated critical habitat (i.e. terrestrial nesting habitat) is located in or along the shores of Puget Sound, the Snohomish River, or Possession Sound. Designated critical habitat does not include marine foraging habitat.

The closest nesting areas to the lower Snohomish River are located between 13 and 30 miles to the east in the Cascade Mountains east of Lake Stevens and north of Sultan (approximately 34 records) and approximately 35 miles west in Olympic Mountains, west of Port Hadlock and Port Townsend (approximately 15 records) (WDFW PHS database search August 20, 2003).

Although appropriate foraging habitat is available in central Puget Sound, including Possession Sound and Port Gardner Bay, marbled murrelets are not commonly seen in either of these areas. The industrialized nature and shallow depths of the lower Snohomish River make the occurrence of marbled murrelet in the vicinity of the proposed dredging and disposal at the Riverside site extremely unlikely.

6.3.2 Analysis of Effects

Potential effects of the proposed maintenance dredging on marbled murrelets primarily include disturbance and increased turbidity during disposal of dredged sediments that may inhibit foraging or result in temporarily reduced food availability. Noise (running heavy equipment) and temporary increases in turbidity during dredging and disposal will likely cause prey fish to avoid the immediate area of the dredging and disposal operations. Consequently, in the unlikely event that a marbled murrelet was present within the immediate vicinity of the disposal areas, they would be expected to temporarily avoid the immediate area and forage elsewhere until disposal operations are completed.

Because the action area represents a small portion of the foraging habitat locally available for marbled murrelets within Puget Sound, any such interference with murrelet foraging activity is expected to be insignificant and discountable, ending when the dredging and disposal activities are completed. Noise and activity levels during the dredging and disposal activities are expected to be within the range of recurrent ambient levels within these industrialized areas.

Any interference with murrelet activity will end when dredging and disposal is completed. Marbled murrelet prey availability should also not be substantially affected while the benthic community reestablishes along the dredge channel and within the disposal areas. Long-term degradation of marine foraging habitat is not expected. Survival and reproductive success of marbled murrelet will be unaffected due to the lack of appropriate nesting habitat within the action area.

For the reasons described in Section 5.4 of the September 2003 BA (Corps 2003), no significant cumulative, interrelated or interdependent effects on the marbled murrelet are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

6.3.3 Take Analysis

No marbled murrelets are expected within the vicinity of the upstream settling basin or the Riverside site during disposal operations. Thus, there would be no significant disruption of normal behavior patterns sufficient to create the likelihood of injury or ‘take’ of any marbled murrelets. Therefore, the potential for incidental take in any form (including harassment) is considered negligible.

6.3.4 Conservation Measures

No specific conservation measures are warranted, because the potential for adverse effects on the marbled murrelet from short-term dredging and disposal operations is negligible. Conservation measures described in Section 6.5.5 for bull trout and Section 6.6.5 for chinook salmon of the September 2003 BA (Corps 2003), are expected to also benefit marbled murrelets by limiting effects on their fish prey.

6.3.5 Effect Determination

Proposed maintenance dredging and disposal activities at the Riverside site will not result in any long-term degradation of habitat or other significant adverse effects on marbled murrelets. Short-term effects such as noise disturbance and reduced prey availability will not occur or will be very small in magnitude, as discussed above. Temporary disturbance to foraging activities are expected to be insignificant and discountable. The survival or reproductive success of marbled murrelets in the project vicinity would not be affected.

Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** the marbled murrelet. Similarly, the proposed maintenance dredging and disposal activities are **not likely to adversely modify** marbled murrelet critical habitat as the proposed activities would not occur within designated critical nesting habitat or surrounding forested areas.

6.4 Steller Sea Lion

6.4.1 Occurrence in Project Area

Steller sea lions are known to migrate into Puget Sound and have been sporadically seen in inland water areas, including the San Juan Islands, rock outcroppings along the Strait of Juan de Fuca, near Everett, in Shilshole Bay, off the Ballard Locks, and occasionally in south Puget Sound. However, they are not considered common residents of the action area, with no breeding rookeries identified in Washington, and haul-out areas generally confined to the Columbia River, the western and northern coasts of the Olympic Peninsula, and the coast of Vancouver Island and the Gulf Islands in British Columbia.

Steller sea lions may occasionally be found on navigation buoys in Puget Sound. Documented locations include: in the western Strait of Juan de Fuca around Pachena Point, on the Toliva Shoals buoy off the south tip of Fox Island, south of Gig Harbor, and several areas in southern British Columbia, including Race Rocks southeast of Becher Bay, Trial Island off of Victoria, and the Belle Chain area of the Gulf Islands (Jeffries et al. 2000). Thus, although Puget Sound falls within the distribution of Steller sea lion, their numbers in the region are generally small and mostly concentrated in the northern portion of Puget Sound and the Strait of Juan de Fuca.

6.4.2 Analysis of Effects

Potential effects of the proposed maintenance dredging on Steller sea lions primarily include disturbance during haul out and inhibited foraging due to disturbance and increased turbidity during disposal of dredged sediments. Noise (running heavy equipment) and temporary increases in turbidity during dredging and disposal will likely cause prey fish to avoid the immediate area of the dredging and disposal operations. Consequently, in the unlikely event that a Steller sea lion was present within the immediate vicinity of the Riverside site, they would be expected to temporarily avoid the

immediate area and forage or haul out elsewhere within the marina until disposal operations are completed.

Because the action area represents a small portion of the foraging habitat locally available for Steller sea lions within Puget Sound and they do not commonly forage within this area, any such interference with Steller sea lion foraging activity is expected to be insignificant and discountable, ending when the dredging and disposal activities are completed. Noise and activity levels during the dredging and disposal activities are expected to be within the range of recurrent ambient levels within these industrialized areas and are thus not expected to affect the rare Steller sea lion that could be present within the action area during dredging or disposal activities.

Steller sea lion prey availability should also not be substantially affected while the benthic community reestablishes along the dredge channel and within the disposal areas. Long-term degradation of marine foraging habitat is not expected. Survival and reproductive success of the Steller sea lion will be unaffected due to the lack of any breeding rookeries within the action area.

For the reasons described in Section 5.4 of the September 2003 BA (Corps 2003), no significant cumulative, interrelated or interdependent effects on the Steller sea lion are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

6.4.3 Take Analysis

In the unlikely event that Steller sea lions are present in the lower Snohomish River during disposal at the Riverside site, foraging activities may be temporarily disturbed. However, this disturbance would not be expected to significantly disrupt normal behavior patterns sufficiently to create the likelihood of injury or 'take' of any Steller sea lions. Therefore, the potential for incidental take in any form (including harassment) is considered negligible.

6.4.4 Conservation Measures

No specific conservation measures are warranted, because the potential for adverse effects on the Steller sea lion from short-term dredging and disposal operations is negligible. Conservation measures described in Section 6.5.5 for bull trout and Section 6.6.5 for chinook salmon of the September 2003 BA (Corps 2003), are expected to also benefit Steller sea lions by limiting effects on their fish prey.

6.4.5 Effect Determination

Proposed maintenance dredging and disposal activities will not result in any long-term degradation of habitat or other significant adverse effects on Steller sea lions. Short-term effects such as noise disturbance and reduced prey availability will not occur or will be very small in magnitude, as discussed above. Temporary disturbance to foraging

activities are expected to be insignificant and discountable. The survival or reproductive success of Steller sea lions would not be affected.

Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** Steller sea lions.

6.5 Bull Trout – Coastal/Puget Sound Distinct Population Segment

6.5.1 Occurrence in Project Area

Native char (bull trout and Dolly Varden) are believed to coexist in the Snohomish River drainage. Bull trout migrate and are captured throughout the inner bays of northeast Puget Sound from Possession Sound, Port Susan, Skagit Bay, Padilla Bay, out to Whidbey Island (F. Goetz, USACE, unpublished data). Current information suggests that bull trout first enter tidally influenced waters in Puget Sound as age-2 fish with an average length of approximately 150 mm (varying between 85 mm and 210 mm); they are generally strong swimmers and prefer habitats along the margins of the main stream channel and off channel habitats (F. Goetz, USACE, personal communication, May 25, 2004). The seasonal timing of entry extends from mid-February to early September. Upon entry, the juvenile fish may elect to rear in the tidally influenced delta within intertidal marsh, distributary channels, or along mainstem habitat areas, or may pass through into nearshore marine areas. Larger juveniles may elect to migrate substantial distances through the nearshore marine environment from the natal river basin to adjacent areas.

In Puget Sound tidally influenced floodplain areas, subadult bull trout have been observed or captured in three restored and two natural tidal channels and larger distributary channels, including areas along the lower Snohomish River: two small tidal channels off Ebey Slough (M. Rowse, NMFS, unpublished data), Union Slough, in the spring of the first year after dike removal and restoration of Spencer Island (Tanner et al. 2002), and all three distributary channels of the Snohomish River – Union, Steamboat, and Ebey Sloughs in upstream and downstream migratory movements during spring, summer, and fall of 2002 (F. Goetz, USACE, unpublished data).

Additional details regarding the distribution and occurrence of bull trout in the lower Snohomish River can be found in Section 6.5.2 of the September 2003 BA (Corps 2003), based largely on the multi-year acoustic telemetry study the Seattle District Corps has been conducting of sub-adult and adult bull trout use of nearshore marine waters from the Snohomish River to Padilla Bay.

6.5.2 Analysis of Effects

Bull trout migrate through the lower Snohomish River to and from upper basin areas that may include spawning areas in the upper North Fork and South Forks of the Skykomish River. The Corps telemetry study has documented their use of the lower river and

estuary for foraging, particularly during periods of juvenile salmonid out-migration. However, it is unlikely that either juvenile or adult bull trout would occur in the settling basins or adjacent portions of the navigation channel their during the proposed dredging period (October 16 to February 14) based on the lack of out-migrating juvenile salmonids to prey upon and on the migratory behavior of bull trout observed in the Corps recently completed telemetry study. The observation that 98 percent of all tagged fish left the tidally influenced areas by July 31, and at the latest by August 12 supports this conclusion.

While some bull trout may move downstream in response to the onset of fall rains, the majority of the fish in which we documented this behavior moved downstream only as far as the upper limit of tidal influence (at or above RM 15 in the Snohomish River and at RM 11 in the Skagit River), well upstream of the areas of proposed dredging (up to RM 6.3) and disposal at the Riverside site. The four fish that moved completely or partially through the estuary toward marine waters did so during the early portion of the dredging window (mid-November), returned to the upper basin by early December, and then did not reenter marine areas again until early March 2003. Except for these brief periods of movement in response to rainfall/high flow events, the results of the telemetry study indicate that bull trout are not present within the lower Snohomish River during the period of the proposed dredging.

The occasional adult or sub-adult bull trout which may be migrating through the lower Snohomish River during the period of the dredging operations is likely to avoid the area of the dredging and return of water from the Riverside site due to the associated zone of temporarily increased turbidity. They would be able to avoid the dredging area by seeking refuge over the shallow intertidal areas along either side of the navigation channel and upper settling basin. Foraging habitat, such as these intertidal areas, would not be affected by the dredging. Populations of prey important to bull trout (juvenile salmon and forage fish) are unlikely to be affected by the proposed dredging and disposal operations (see Sections 5.3.1.1 and 5.3.3 of the September 2003 BA, Corps 2003).

This information, in combination with the conservation measures described below in Section 6.5.5 of the September 2003 BA (Corps 2003), particularly avoidance of the juvenile salmon migration period, is expected to prevent adverse short-term effects to bull trout during dredging and disposal operations. The temporary loss of the benthic and forage fish communities during dredging is expected to have a negligible effect on long-term habitat quality within the action area. Overall, the effects of the proposed action would be insignificant and discountable due to the temporary duration of the dredging activities and the implementation of the proposed conservation measures to minimize the potential for bull trout to be within the action area during dredging.

6.5.3 Take Analysis

If the proposed dredging operations were to be conducted during migration periods, bull trout could be susceptible to short-term harassment during their migration periods. Maintenance dredging could create the likelihood of injury to such an extent as to

significantly disrupt normal behavior patterns during peak migration periods. However, adoption of the conservation measures listed in Sections 6.5.5 and 6.6.5 of the September 2003 BA (Corps 2003), particularly avoidance of the juvenile salmon migration period, reduces the potential for incidental take in the form of harm or harassment of bull trout to a negligible level.

6.5.4 Effect Determination

Through the Corps telemetry study, sub-adult and adult bull trout have been documented in the lower Snohomish River and the larger action area. Therefore, the project may affect the threatened Coastal/Puget Sound bull trout. Conservation measures (as described in Section 6.5.5 of the September 2003 BA, Corps 2003), including avoiding dredging during the migration period of juvenile salmonids, would prevent adverse short-term effects to bull trout during dredging operations. Dredging would result in temporary degradation of the water quality; these effects would be limited to the immediate dredging site and bull trout are believed to readily be able to avoid areas with temporarily degraded water quality conditions. The temporary loss of the benthic and forage fish communities in the dredging areas would have only a negligible effect on bull trout habitat, especially since juvenile bull trout forage mainly outside of the navigation channel along the intertidal edges and adjacent off channel habitats. In the event that an occasional bull trout would be migrating through the dredging areas in response to rainfall events, they would be expected to readily avoid the project area during dredging operations by utilizing undisturbed habitats along the edges of the navigation channel.

For the reasons described in Section 5.4 of the September 2003 BA (Corps 2003), no significant cumulative, interrelated or interdependent effects on bull trout are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

Overall, the effects of the proposed action on Coastal/Puget Sound bull trout would be insignificant and discountable. Therefore, the proposed maintenance dredging activities **may affect, but is not likely to adversely affect** Coastal/Puget Sound bull trout.

6.6 Chinook Salmon

6.6.1 Occurrence in Project Area

Four chinook salmon stocks are present within the Snohomish River drainage: Snohomish summer chinook, Snohomish fall chinook, Bridal Veil Creek fall chinook, and Wallace River summer/fall chinook (WDFW SASI 1994). The Snohomish summer- and fall-run populations, maintained by natural production, are classified as depressed (Priority Habitat and Species database search August 22, 2003, WDFW SASI 1994). Habitat degradation in the mainstem river due to agricultural diking and industrial pollution, in addition to a lack of large woody debris and gravel removal are believed to negatively affect production of the Snohomish River summer and fall stocks (WDFW SASI 1994). The Wallace River stock is considered to be a mixture of wild stocks and

hatchery straying. The Wallace River stock is considered healthy and the Bridal Veil Creek stock status is unknown due to sparse survey data (WDFW SASI 1994).

Adult use of the estuary and lower river is largely limited to migration and physiological transition from salt to fresh water. Adult chinook return to the estuary and begin to reenter fresh water beginning in June and July and continuing through August and September. In contrast, juvenile salmonids depend on estuarine environments for migration, physiological transition from fresh to salt water, feeding, and refuge from predation and displacement during migration. Out-migrating chinook salmon juveniles are present in the estuary from April through July.

In Puget Sound, designated critical habitat for chinook salmon includes all marine, estuarine, and river reaches accessible to the species. Thus, all of the waters within the project area are within the designated critical habitat for chinook salmon.

6.6.2 Analysis of Effects

The occurrence of adult chinook migrating through the lower Snohomish River during the dredging period (October 16 to February 14) is unlikely based on the timing of adult upstream migration (July through September) and spawning (September and October). Any late migrating adult or sub-adult chinook salmon within the lower Snohomish River during the period of the dredging operations are likely to avoid the area of the dredging and of the return water from the Riverside site due to their zones of temporarily increased turbidity. They would be able to avoid the dredging area by seeking refuge over the shallow intertidal areas along either side of the navigation channel and the upstream settling basin. Juvenile foraging habitat, such as these intertidal areas, would not be affected by the dredging. Populations of prey important to juvenile and adult chinook salmon (invertebrates and forage fish) may be affected by the proposed dredging and disposal operations, but these effects are expected to be insignificant and discountable due to their brief and temporary nature. Similarly, chinook salmon within the vicinity of the Riverside Business Park disposal site would be expected to move out of the area of the return water.

This information, in combination with the conservation measures described below in Section 6.5.5 of the September 2003 BA (Corps 2003), particularly avoidance of the juvenile salmon migration period, is expected to prevent adverse short-term effects to chinook salmon during dredging and disposal operations. The temporary loss of the benthic and forage fish communities during dredging is expected to have a negligible effect on long-term habitat quality within the action area. Overall, the effects of the proposed action would be insignificant and discountable due to the temporary duration of the dredging activities and the implementation of the proposed conservation measures to minimize the potential for chinook salmon to be within the action area during dredging.

6.6.3 Take Analysis

If the proposed dredging operations were to be conducted during migration periods, chinook salmon could be susceptible to short-term harassment during their migration

periods. Maintenance dredging could create the likelihood of injury to such an extent as to significantly disrupt normal behavior patterns during peak migration periods. However, adoption of the conservation measures listed in Sections 6.5.5 and 6.6.5 of the September 2003 BA (Corps 2003), particularly avoidance of the juvenile salmon migration period, reduces the potential for incidental take in the form of harm or harassment of chinook salmon to a negligible level.

6.6.4 Effect Determination

Adult, sub-adult, and juvenile chinook salmon utilize the lower Snohomish River and the larger action area. Therefore, the project may affect the threatened Puget Sound chinook salmon. However, any chinook salmon present would experience negligible effects from the proposed dredging operations.

Conservation measures (as described in Sections 6.5.5 and 6.6.5 of the September 2003 BA), including avoiding dredging during the migration period of juvenile chinook salmon, would prevent adverse short-term effects to chinook salmon during dredging operations. Dredging would result in temporary degradation of the water quality; these effects would be limited to the immediate dredging site and chinook salmon are believed to readily be able to avoid areas with temporarily degraded water quality conditions. The temporary loss of the benthic and forage fish communities in the dredging areas would have only a negligible effect on chinook salmon habitat, especially since juvenile chinook salmon forage mainly in intertidal areas outside of the navigation channel. In the unlikely event that chinook salmon would be present during dredging, they would be expected to readily avoid the project area during dredging operations.

For the reasons described in Section 5.4 of the September 2003 BA (Corps 2003), no significant cumulative, interrelated or interdependent effects on Puget Sound chinook salmon are expected from the proposed dredging and disposal activities when considered in conjunction with other projects or actions.

Overall, the effects of the proposed action on Puget Sound chinook salmon would be insignificant and discountable. Therefore, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect** Puget Sound chinook salmon. Similarly, the proposed maintenance dredging activities **may affect, but are not likely to adversely affect designated critical habitat** for Puget Sound chinook salmon.

7.0 ESSENTIAL FISH HABITAT

Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Act, which regulates fishing in US waters, to establish new requirements for "Essential Fish Habitat" (EFH) descriptions in federal Fishery Management Plans (FMPs) and to require federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that would adversely affect EFH. The Pacific States Fishery Management Council amended the Pacific Groundfish Fishery Management Plan and the Coastal Pelagic Species Management Plan (1998a, 1998b) to designate waters

and substrate necessary for spawning, breeding, feeding, and growth of commercially important fish species.

The marine extent of salmon, groundfish, and coastal pelagic EFH includes those waters from the nearshore and tidal submerged environments within Washington, Oregon, and California state territorial waters out to the exclusive economic zone (370.4 km) offshore between the Canadian border to the north and the Mexican border to the south. There are seven composite EFHs: estuarine, rocky shelf, non-rocky shelf, canyon, continental shelf/basin, neritic and oceanic habitats. Disposal of dredged sediments at the Riverside Business Park site does not impact any of these EFHs. The Corps maintenance dredging occurs exclusively in soft substrate areas within the Snohomish River navigation channel (estuarine EFH). Thus, please refer to Section 7.0 of the September 2003 BA (Corps 2003) for details regarding the effects of the proposed dredging on EFH.

The Corps believes the combination of the conservation measures detailed in Section 7.0 of the September 2003 BA (Corps 2003) will reduce effects on Essential Fish Habitat to the point that the effects will be insignificant and discountable, and thus the proposed dredging and disposal operation **may affect, but is not likely to adversely affect** Essential Fish Habitat.

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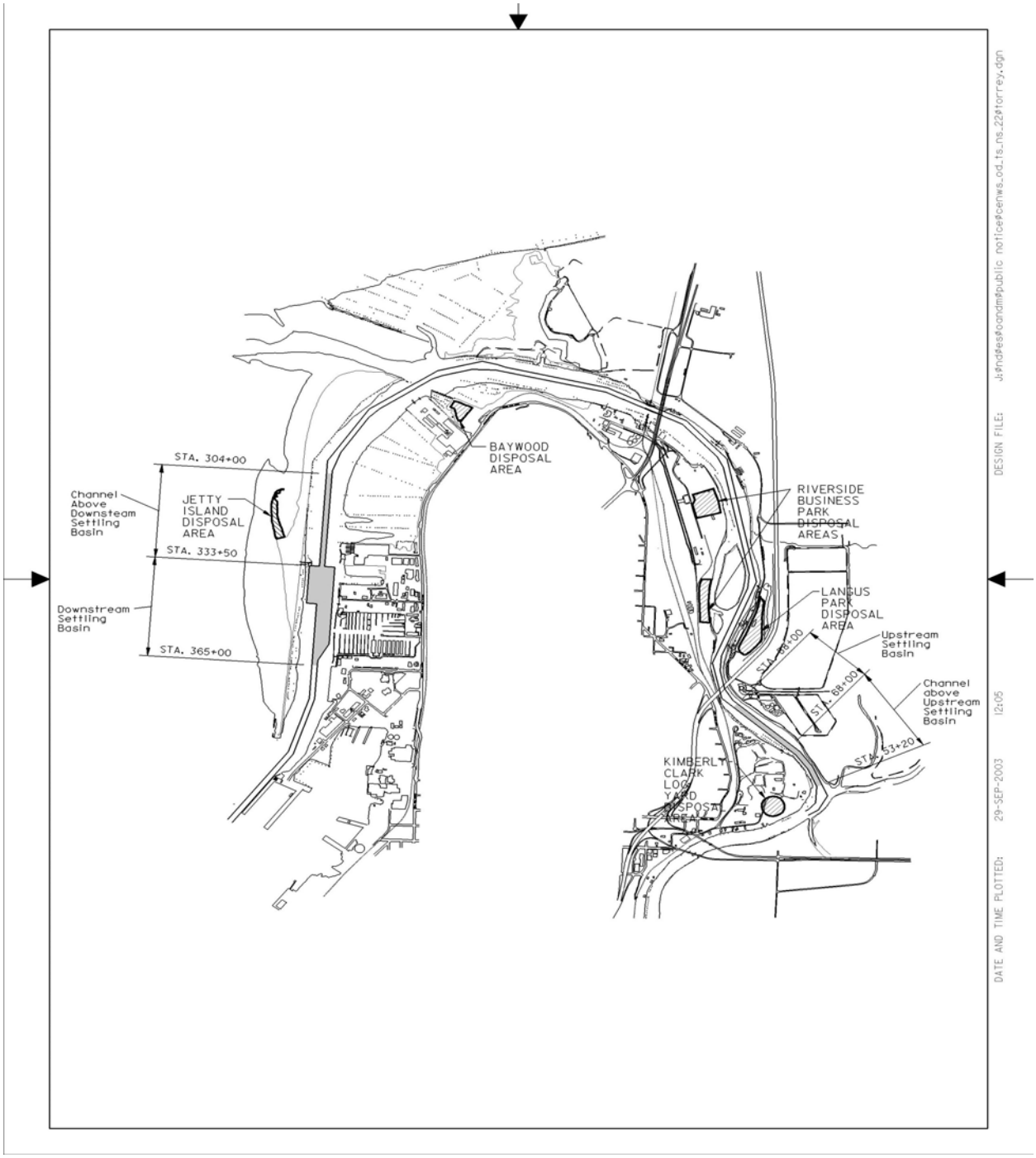

Figure 1: Location and extent of dredging in upper and downstream settling basins and location of Riverside disposal site.

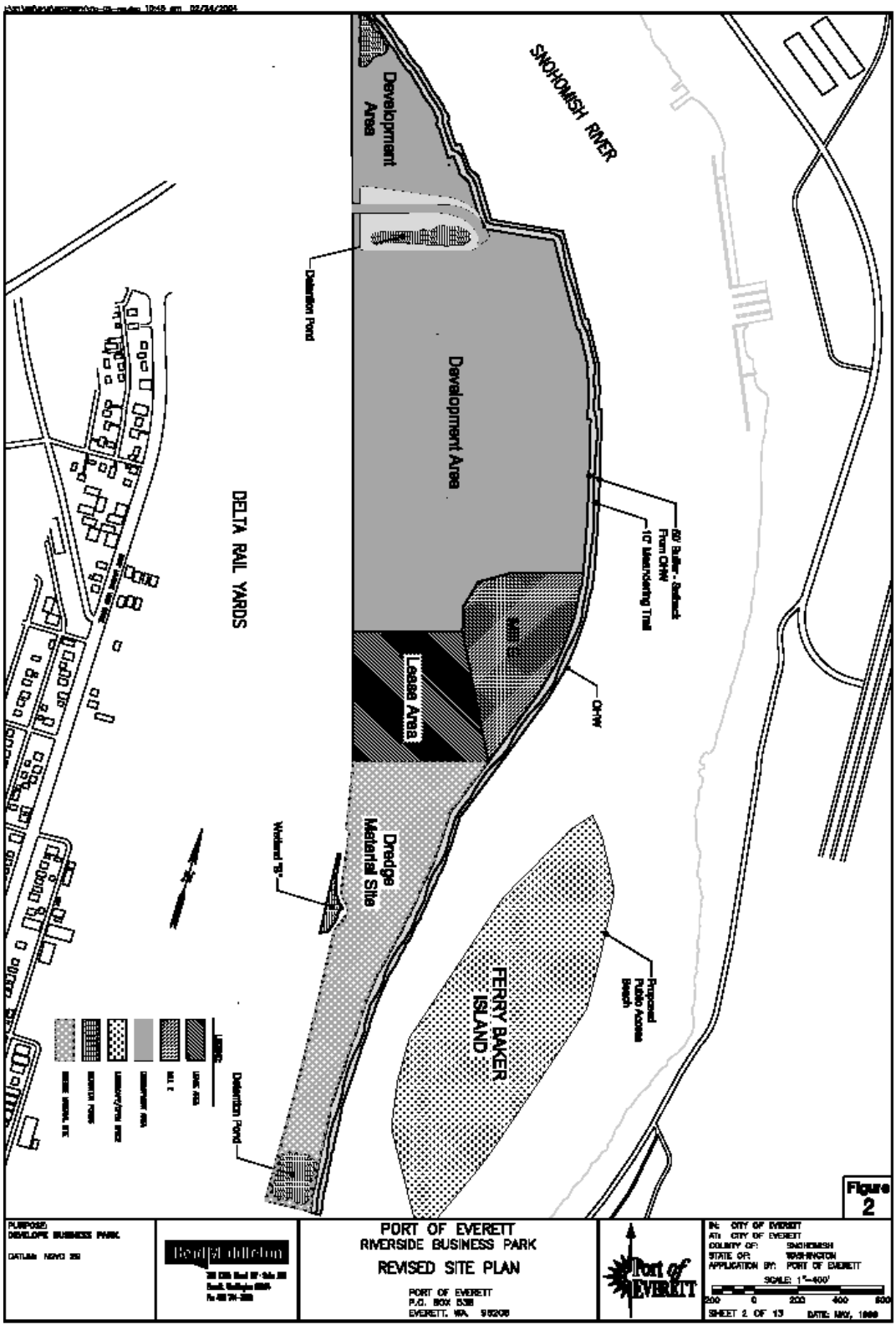

Figure 2: Riverside Business Park site and dredge material cell

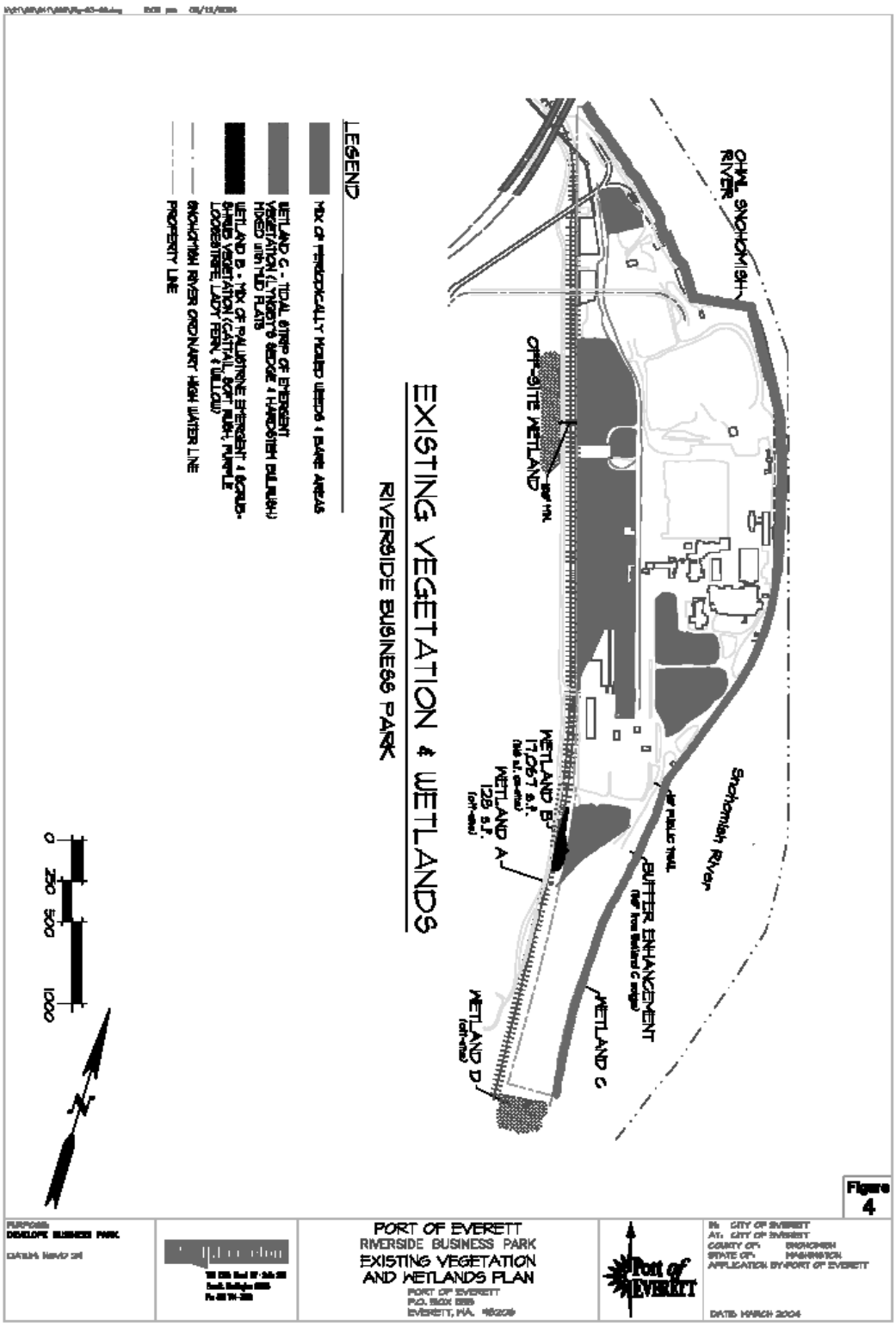

Figure 3: Riverside Business Park site, extent and location of wetlands

Photo 1: Riverside Business Park site facing south, southern portion, dredged material cell and rehandling of material (April 2004).

Photo 2: Hydraulic pipeline (not in use) showing buoys used to cap ends during placement (April 2004).

Photo 3: Salt marsh bench fringing eastern edge of Riverside site, facing downstream; hydraulic pipeline crosses bench at downstream end, beneath bridge (April 2004).

Photo 4: Hydraulic pipeline floating in Snohomish river channel (facing downstream) and extending onto and over the salt marsh bench to deposit material within the Riverside site (not visible, but off lower left corner of photo).

Photo 5: Southeastern corner of Riverside site showing riparian edge of river and berm separating the dredge disposal cell from the riparian edge (April 2004).

Photo 6: Previously disturbed area of riparian buffer through which weirs are placed during return of water to river, facing upstream to the north (April 2004).

Photo 7: Overview of general site conditions over majority of the Riverside Business Park site, facing south (April 2004).